12-2015

RISK ANALYSIS AND DISASTER RECOVERY: A FLORIDA LIHTC CASE STUDY

Valerie Hammett
Clemson University, vhammet@clemson.edu

RISK ANALYSIS AND DISASTER RECOVERY:
A FLORIDA LIHTC CASE STUDY

A Dissertation
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy
Planning, Design, and the Built Environment

---

by
Valerie Lynn Hammett
December 2015

Accepted by:
Dr. Mickey Lauria, Committee Chair
Dr. Stephen Verderber
Dr. Christopher Post
Dr. Tim Green
Dr. Jim London

ABSTRACT

In spite of numerous programs and policies that encourage private investment in affordable housing, particularly after hurricane disaster, insufficient numbers of affordable units exist to meet demand. Some low-income households are displaced in the course of disaster recovery, and others face severe housing cost burdens as demand for affordable housing outstrips supply. Some suggest competitive uses for limited funds impede production. Others suggest that disaster and recovery policies tend to favor homeowners and economic recovery. Little attention has been given to the development decisions of affordable housing developers during disaster recovery. This study examines LIHTC development risk after the 2004 hurricane season. Stated preferences are identified from the public housing agency and LIHTC professionals to identify factors that impede or encourage investment after disaster. Statistical and spatial analysis is used to compare development patterns to risks identified from stated preferences of LIHTC developers. The number of LIHTC units found within storm surge boundaries places communities, households, and owners at significant risk. This study suggests that policy preferences steer LIHTC development to coastal communities in spite of risk. Ultimately, policy can also take steps to encourage mitigation of current and future hurricane risks.

Keywords: affordable housing, coastal hurricane, disaster recovery, GIS, LIHTC, storm surge

DEDICATION

This dissertation is dedicated to the women who raised me: to my grandmother, Edna Hammett Stone, for instilling a sense of wonder and adventure; to Thelma D. Wood, the one who taught me to question everything and to look for answers; to my stepmother, who always had faith in me; and to my mother, who was with me for such a short time but showed me I could accomplish anything and to never give up. I also dedicate this to my sisters, Karen, Tara, Dede, and Kim, and my daughters, Elizabeth and Savannah, thank you for your encouragement and your patience. I love you all so much.

I also have to recognize the men who have shaped my life. To my dad, Eugene Wayne Hammett, who passed away shortly after I began my studies at Clemson, I know you would be proud. Thank you for raising me to be an independent woman and teaching me to ponder the great unknown. To my grandfather, Thomas Vernon Wood, you indulged my frustration with this world when I was young and let me think I could help to make a better one. I will always love you for that.

To Kay and Paula, you two have been my rock. To Richard, thank you for your love, support and encouragement.

Finally, I dedicate this to Hershey.

ACKNOWLEDGMENTS

I want to thank everyone who has been a part of this journey. Each of you has shared your knowledge and time; you have been a sounding board, and at times, my strength to keep going. I want to acknowledge my cohort, Melanie, Deborah, George, and especially Noel. I do not think it is a secret that I have faced quite a few personal challenges during my tenure at Clemson University. You will never know how much I appreciate all of your encouragement.

I want to thank my committee who has graciously shared their expertise and knowledge. To my chair, Dr. Mickey Lauria, your thoughtful feedback was always encouraging. To Dr. Stephen Verderber, your encouragement to remain true to my interests has kept me focused. Your personal experience and first-hand knowledge were helpful as I formulated the direction I would take. Dr. Christopher Post, your positive nature encouraged me while at the same time nudging me to dig just a little deeper, take another step, and tell a better story with the tools you gave me. Dr. Tim Green, you encouraged me to think through my ideas and focus on what I was analyzing. To Dr. Jim London, your support and wisdom have been good counsel from the start.

So many others have helped me along the way. I especially want to recognize Dr. Elaine Worzala, who invited me into the program. She always looked for opportunities that would allow me to grow as a teacher and a scholar. I developed the foundation of my research under her guidance. Her dedication to academia, to real estate, and to women in these fields inspires me. I look forward to enjoying our friendship for many

years to come. I also have to thank Dr. Terry Farris, who freely shared his experience and knowledge so that I would understand the underpinnings of the LIHTC industry. You gave me hours to save me weeks. I am especially thankful to Dr. Betty Baldwin who shared her experience and guidance in the development of my survey; and thank you to Dr. Billy Bridges who guided me through the survey analysis. Thank you to Dr. Ed Yokely, who I met by chance at just the right time. Your interest and willingness to talk about my work pulled me through.

Finally, to all of my professors, your classes were engaging and personable. You were all very supportive and your feedback helped me more than you know. Thank you for what you do and for doing it so well.

TABLE OF CONTENTS

Page

Table of Contents (Continued)

Page

Table of Contents (Continued)

Page

Table of Contents (Continued)

Page

LIST OF TABLES

Page

List of Tables (Continued)

Page

LIST OF FIGURES

Page

List of Figures (Continued)

Page

Chapter 1

THE HAZARDOUS COAST

INTRODUCTION

The latest Intergovernmental Panel on Climate Change (IPCC) has sounded a wake-up call for urban policy makers. Scientists have stated with 95% certainty that human activity and greenhouse gases are extremely likely to be the cause of global warming (IPCC, 2014). The effects of global warming include sea level rise, increasing periods of drought, extreme weather conditions, and more extreme tropical storms and hurricanes. Experts warn that in the U.S., Florida and Texas are especially vulnerable to the effects of global warming (IPCC, 2014).

Florida has experienced exponential growth over the last 40 years. The population increased by more than 195% from 1970 to 2010 (Florida Department of Health, 2012). It is well understood that the most significant disaster risk for the state is from hurricanes. The state is also vulnerable to sea-level rise, particularly in Miami-Dade County, which is considered one of the most vulnerable locations in the country (Revi et al., 2014, p. 555; Beatley, 2009). This study takes a closer look at how disaster recovery and housing policy affected affordable housing development in Florida after the 2004 hurricane season, specifically multifamily housing produced using Low Income Housing Tax Credits.

DISASTER IN THE COASTAL URBAN ENVIRONMENT

The threat of disaster poses special challenges for coastal communities, particularly in the multifamily housing sector. Programs and policies that effect outcomes for community redevelopment after disaster typically favor homeowners and economic development projects favored by community leaders and their constituents (Comerio, 1988; Fischer and Sard, 2006; Peacock, Dash and Zhang, 2007). A constituent could include business leaders, advocacy groups, or any other group that has access to power (Rehfeld, 2005). When thinking about local and regional projects promoted by those who control the purse strings within a community, the constituency generally includes participants within the business community that favor allocation of funds to a diverse range of redevelopment options (Comerio, 1988; Fothergill and Peek, 2004). One subset of redevelopment is affordable housing.

This research focuses on redevelopment of affordable housing during disaster recovery using the Low Income Housing Tax Credit (LIHTC) program. Since 1996, the LIHTC program has been the predominant mechanism for funding affordable multi-family housing production across the U.S. In spite of developer participation in LIHTC, affordable multifamily housing shortages continue to be problematic, especially after disaster. The intent of this study was to understand how LIHTC preferences influenced affordable housing development after the Florida 2004 hurricane season by examining perceived risk in the context of disaster recovery.

Growth and Development in Coastal Communities

Since 1970, an exploding U.S. population has migrated to the coast. Population on the coast has generally followed national trends. The problem, however, is coastal population is concentrated within a limited land area (Crossett et al., 2004). A densely populated coast places a significant burden on local and state governments who need to assess environmental and economic challenges imposed by potential hurricane damage. Hurricanes are the most common natural hazard in east coast communities, regardless of climate change (Pielke et al., 2008). The effects of climate change are expected to intensify hazardous conditions.

Growth in coastal communities is driven by economic activity related to recreation, tourism, water-reliant industry and commerce, and employment (The Heinz Center, 2000; Crosset et al., 2004; U.S. Commission on Ocean Policy, 2004). Economic activity along the coast supports not only the year round coastal population, but also the more than 180 million seasonal visitors to coastal regions each year. Tax revenue from tourist activities alone encourages policies that support even more growth. Commercial activities surrounding natural resources in coastal areas generate billions of dollars each year (Marlowe, 1999; U.S. Commission on Ocean Policy, 2005). Fisheries generate more than $32 billion in income and over 1 million jobs in the U.S. (National Marine Fisheries Service, 2014). In 2010, the Bureau of Economic Analysis estimated that coastal shoreline counties generated 45% of gross domestic product (GDP) for the U.S (NOAA, 2013b). Shoreline counties generate over 54% of GDP for coastal states. More than 50 million jobs and $2.7 trillion in wages were generated in coastal shoreline counties, including the Great Lakes Region (NOAA, 2013b). All of this robust economic

activity encourages even more development that in turn contributes to a continuing migration to coastal communities.

Population density in coastal areas has been expanding at a rapid pace for nearly half a century. In 2010, population density for the U.S. was 87 persons per square mile (NOAA, 2013a, p. 3). During the forty years between 1970 and 2010, the U.S. added 36 persons per square mile overall (Crowell et al, 2010; NOAA, 2013a, p. 3). In contrast, coastal shoreline counties added 125 persons per square mile during the same forty year period resulting in a density of 446 persons per square mile in coastal counties (NOAA, 2013a, 3; Crossett et al., 2004). Population density of this magnitude puts more pressure on the natural resources and economic stability essential to a sustainable existence. The current U.S. coastal population is estimated at 123.3 million or 39% of the national population and growing (Crowell et al, 2010; NOAA, 2013, p. 5). Coastal population growth is expected to increase another 8%, meaning that by 2020, another 10 million people will reside on or near the coast (NOAA, 2013, p. 4). Coastal counties encompass roughly 10% of land area in the United States, excluding Alaska. Population density of this scale imposes significant risks on those that live, work, and operate businesses on the coast, particularly when disaster strikes. The effect of disaster places an even greater burden on coastal states that must allocate limited resources while attempting to project the potential impact of coastal disaster on housing and essential services.

Climate Change and Disaster in Coastal Communities

Climate change is predicted to affect the intensity of natural coastal hazards in the coming years. Sea level rise is likely to increase in more than 95% of the ocean causing a

twenty percent increase in mean sea level in 70% of coastal areas worldwide (IPCC, 2013, p. 1140). The U.S. will not be immune to the effects of climate change. Rising sea levels will contribute to higher storm surges, causing more extreme flooding and storm damage from even minor coastal storms. Climate change also contributes to warming oceans which in turn causes more intense and destructive hurricanes. Over the past 30 years, the duration and wind speed of hurricanes have shown an increase in the destructive power in the Atlantic and Pacific Oceans (Emanuel, 2005). There has also been an increase in the number of Category 4 and 5 hurricanes, correlating with rising ocean temperatures (Webster et al., 2005). Future storm models suggest that storms are likely to become even more intense with an average rainfall increase of 18% over the next eight years (Knutson and Tuleya, 2004; IPCC, 2014). Storm modeling trends are impeded by limited availability of storm data creating uncertainty in the literature (Knutson et al., 2010). Regardless, most scholars agree that climate change will cause tropical storms and hurricanes to intensify in frequency, strength, and damage potential while the frequency of less intense storms will decline (Knutson and Tuleya, 2004; Knutson et al., 2010; IPCC, 2014).

Hurricanes can cause significant damages when they strike. Property owners are susceptible to damages from wind, flooding, and storm surge. Social and economic costs associated with these damages can be significant and devastating to individuals, business and communities. Blake et al. (2011) found the greatest number of deaths from hurricanes occurred in 1900 when 8,000 people were killed after a Category 4 hurricane struck Galveston, Texas. Since then, deaths from hurricanes have declined in part

because of more advanced early warning systems allowing coastal inhabitants to evacuate or take precautions. However these systems have not been perfect. The most significant U.S. death toll from a hurricane occurred in 2005 after Hurricane Katrina struck the Gulf Coast. As many as 1,833 people died from causes related to Hurricane Katrina.

Disaster can also have a devastating effect on the social and economic fabric of coastal communities. Increased development along the coast costs millions in taxpayer dollars after disaster as shown from federal flood insurance claims and disaster assistance programs (Godschalk et al., 1989). Between 1980 and 1999, economic damages from hurricanes totaled more than $68 billion in the U.S. (Davidson and Lambert, 2001 quoting NOAA, 2000). Beven et al. (2008) found even higher costs during 2005, the most active hurricane season on record since 1969. The economic cost of the 2005 hurricane season included over $100 billion in damages (Beven et al., 2008). Pielke and colleagues (2008) found the 2004 and 2005 hurricane season caused more than $150 billion in damage averaging $75 billion over the two year period. Normalized damage estimates of hurricanes from 1900-2005 found the decade between 1996 and 2005 as the second most costly decade after the ten year period of 1926-1935. The Great Miami Storm of 1926, which struck during the Florida land boom of the 1920's, was the single most damaging storm during the period, causing between $140-157 billion in normalized damages (Pielke et al., 2008). While deaths from hurricanes have declined, economic costs continue to rise, arguably as a result from coastal development.

Hurricanes since 2000 have exposed the disparity that exists between homeowners and renters, wealth and poverty, and the upper and lower classes of

American society. Like with renters, programs and policies that favor homeowners and commercial interests during recovery do not always extend to multifamily housing developers. Investors in affordable and low-income multifamily housing often struggle post-disaster because recovery programs do not meet their financial needs (Wu and Lindell, 2003). Programs and policies tend to favor economic development geared toward infrastructure, commercial businesses, and homeowners (Comerio et al., 1994; Quarentelli, 1999; Mueller et al., 2011). In spite of numerous programs in place to address housing needs for low-income households after Katrina, sufficient incentives for investors failed to meet the needs of displaced renter households resulting in housing disparity and affordable housing shortages. McCarthy and Hanson (2008) found the ratio of permits for damaged single-family units were issued more often than for multifamily units. After Katrina, housing units with less severe damage were more likely to be issued permits quicker than those with extensive damages, contributing to the overall reduction in available low-income rental housing during recovery (McCarthy and Hanson, 2008; Unity, 2010). Vuk (2008) suggests this view is misleading stating that vouchers offset claims of insufficient available housing. Vouchers are used to rent single or multifamily housing and are recognized by some as a more viable alternative to affordable housing than government incentivized housing production (Savas, 1987; Savas, 2000). Much like affordable rental housing, which often has long waiting lists and barriers to access, vouchers are also limited and taken alone cannot rectify affordable housing shortages. This research examined LIHTC multifamily rental housing development during the recovery period after disaster. The 2004 hurricane season in Florida provided the

backdrop to analyze development patterns for LIHTC. This study focused on role of LIHTC after disaster by asking how perceived risk influences development during recovery. The results of this study identified risk through the stated preferences of LIHTC professionals in the context of disaster recovery and compared development patterns of LIHTC multifamily housing between 2004 and 2010.

PROBLEM STATEMENT

The motivation behind this study came from the realization that affordable housing programs have had little success in providing enough affordable housing for the households that need assistance. This is especially true after disaster even though billions of dollars are spent on redevelopment. The goal of this study is to understand the influences that motivate multifamily development during disaster recovery. The aim is to understand how LIHTC developers' perceptions of risk influenced development decisions.

Numerous studies have analyzed the impact of disaster on low-income households. Struggling low-income populations in disaster areas are more likely to fall behind during recovery and often fail to reap the benefits of new investment (Cutter and Emrich, 2006; Fischer and Sard, 2006; Fothergill and Peek, 2004; Popkin et al., 2006; Finch et al., 2010). Communities struggle continuously with poverty, particularly the lack of affordable housing. After a disaster occurs, recovery provides an opportunity to address affordable housing issues, which are often magnified as a result of disaster (Fothergill and Peek, 2004). Unfortunately, the recovery process often increases disparity and decreases accessibility to affordable housing (Cutter and Emrich, 2006).

Several federal housing programs exist that communities depend on to support housing and are also used to address post-disaster housing needs (Table 1-1). Among these are Community Development Block Grants (CDBG), HOME Investment Partnerships Program, Housing Choice Vouchers Program (HCVP), and the Low Income Housing Tax Credit (LIHTC) program. These programs can be combined or used in conjunction with disaster programs to jumpstart economic recovery and redevelopment, including housing production and restoration. In spite of the availability of these and other local initiatives, funding for affordable housing can fall short of the amount necessary to shelter those in need. The loss of more than 51,000 rental units in New Orleans after Katrina very likely contributed to a doubling of the homeless population once recovery was well underway (Unity, 2010). Prior to Katrina, 51 percent of renters paid more than 30% of their income in rent and utilities. The Department of Housing and Urban Development (HUD) defines housing affordability as rent and utilities at 30% or less of gross household income. As of 2012, the number of renters exceeding this amount had increased to sixty-three percent (Plyler, 2013).

Table 1-1: Funding Resources for Disaster Recovery

Program	Purpose
HOME Investments Partnerships Program	Provides grants to States and localities that are often used in partnership with local nonprofits. Eligible activities include constructing, buying, and rehabilitating affordable housing. Funds can be targeted for rentals or homeownership. Low income households may qualify for direct rental assistance. HOME is the largest block grant program.
Community Development Block Grant (CDBG)	Provides resources to communities for a wide range of community development needs. Annual grants are allocated to larger cities and urban counties for housing and expansion of economic opportunities. The primary beneficiaries are principally low- and moderate-income. CDBG has mutiple programs for a wide array of activities. Diaster Recovery Assistance are flexible grants under the program and are subject to availability.
Supplemental LIHTC	Supplemental LIHTC were granted by Congress after Hurricane Katrina. In some cases, credits were advanced from LITHC that was to be awarded in future years.
Federal Disaster Loans	Individual assistance in the form of housing, grants for personal use, low interest loans, counseling and other assistance. Public assistance is available for communities. Low interest loans for renters and homeowners may be available. Issued through the Small Business Administration (SBA).
Hazard Mitigation Grants (HMP)	Applicants come from the State, local government, Indian tribes , and private non-profit organizations. According to FEMA, homeowners and businesses must apply through one of these applicants.
Disaster Bonds	Tax exempt debt instruments issued by Congress and administered by States to direct private investment dollars to disaster recovery.
New Market Tax Credits	Target tax credits to low income markets. Credits are used to encourage investment in economic development and jobs creation in low income communities.
Physical Disaster Loans	Administered under the SBA. Physical disaster loans can be used to repair or replace real and personal property. Businesses of any size are eligible. Interest rates are capped at 4% if no other financing is available or 8% if credit can be obtained elsewhere.
SBA Loans	Other types of disaster loans include Home and Personal Property Loans, Economic Injury Disaster Loans, and Military Reservists Economic Injury Loans.

Sources: FEMA, U.S. Small Business Administration

Studies indicate that multifamily housing falls behind other redevelopment efforts during recovery. Hurricane Ike damaged 88% of Galveston's low-income housing units in 2008. During recovery, multifamily reconstruction lagged behind other redevelopment efforts (Reece et al., 2011). Very few studies concentrate on multifamily development after hurricane disaster. Those that do exist focus on programs that favor homeowners and economic development and expose the disparity experienced by multifamily

developers. Researchers studied CDBG allocations after Katrina. Galster et al. (2004) found that low-income neighborhoods did generally improve. However, about 62% of CDBG funds were allocated to homeowners and only 18% were directed to rental units during recovery (GAO, 2010). This resulted in fewer low-income units overall. Affordable housing also takes a back seat to economic development. Louisiana and Mississippi were criticized because tax dollars funded the rebuilding of fewer low-income units than were in place prior to the disaster. Gotham and Greenburg (2008) found that fewer units were produced because of waivers of CDBG low-income housing requirements in favor of other economic interests.

Congress and the Internal Revenue Service (IRS) have often approved increases or advances in the amount of allocated tax credits to facilitate redevelopment of affordable housing. The LIHTC program, Supplemental Tax Credits, and New Market Tax Credits were earmarked for affordable and low-income housing after Katrina encouraging the development of owner-occupied and rental housing. As a result, the Gulf Opportunity Act of 2005 instituted the Gulf Opportunity Zone (GO Zone) tax program (GAO, 2010). The Government Accountability Office study stated that homeowner allocations were quicker and easier to distribute. Owners of rental properties were expected to access other programs, such as Small Business Administration (SBA) loans and tax credits (p. 19). Small Rental Assistance programs created more barriers than access for investors and developers because of regulatory requirements. Environmental review assessments were required and were costly for investors and owners who had limited ability to increase rents, often the case with affordable and low-

income housing (p. 19). Multifamily owners and developers are also subject to capital markets and credit availability, and even when those markets are in balance, the feasibility of taking on additional debt can curtail development plans (p. 39). Debt affects operating and development costs which have to be weighed against allowable rents. Developers in general, including LIHTC developers, are unlikely to invest in projects that may pose greater financial risks, whether those risks are a result of location, funding, or operational costs. Risks imposed by potential hurricanes in coastal counties would seem to impede affordable multifamily housing development. However this study found no evidence that location imposes fewer LIHTC developed in coastal areas in spite of the greater risks associated with coastal hazards.

The research that is the subject of this work is a revelatory case study that seeks to understand the preferences of LIHTC developers during the recovery process. This study examines the influence of risk perceptions that affect LIHTC developers' decisions during disaster recovery by analyzing the outcomes of LIHTC multi-family housing production during disaster recovery. For this study, developers include professionals involved in the production of LIHTC multifamily housing, including syndicators, bankers, builders, managers, and investors.

PURPOSE STATEMENT AND RESEARCH QUESTIONS

This purpose of this research was to reveal how developer preference influences LIHTC multifamily housing production after disaster, and specifically, how risk perception influences development decisions during recovery. This research examined how developers of LIHTC multi-family housing make investment decisions and

specifically, how risk perception influences those decisions. This research was guided by the following questions:

- How do LIHTC developers perceive disaster risk? What risk variables have the greatest influence on development decisions?
- What are the differences in risk perception between for-profit and non-profit LIHTC providers? How do these differences affect the location of low-income multi-family housing within the LIHTC program?
- Where are LIHTC developments located over the disaster recovery period? Do LIHTC developers avoid areas that experience the greatest impact from the disaster event?

KEY CONCEPTS AND OPERATIONAL DEFINITIONS

There are a number of terms and constructs used in the context of this study that warrant further discussion in order to clarify meaning as they relate to this study.

Defining Disaster

Car (1932) was the first to sequence disaster in relation to cultural protections by defining disaster in the context of consequences within an urban environment. Dombrowsky (1981) viewed disaster as a natural or man-made event that causes substantial negative effects. These are the simplified understandings of the concept that others have expanded upon.

The study of disaster began in earnest shortly after the end of World War II. Along with physical damage studies, scientists also sought to understand the affect of bombing on the human population in Europe and Japan. During what Perry (2007) has

coined the Classical Period of disaster research, disaster was defined as a *"catalyst for what would now be described as a failure of the social system to deliver reasonable conditions of life"* (p. 8).

More than 50 years ago, Charles Fritz (1961), a major pioneer in disaster research, defined disaster as:

> *"Actual or threatened accidental or uncontrollable events that are concentrated in time and space, in which society, or a relatively self-sufficient subdivision of society undergoes severe damage, and incurs such losses to its members and physical appurtenances that the social structure is disrupted and the fulfillment of all or some of the essential functions of the society, or its subdivision, is prevented" (p. 655).*

Fischer (2003), acknowledging Fritz's earlier definition, pointed to sociologists that studied social change under disaster conditions, which is noted in the work of those who search for meaning and clarification in the social condition of disaster survivors (Cutter, 1995; Enarson, 1998; Enarson, Fothergill, and Peek, 2006). In the field of anthropology, disaster is defined as an event *"involving a combination of potentially destructive agent(s) from the natural and/or technological environment and a population in a socially and technologically produced condition of environment vulnerability"* (Oliver-Smith, 1996, p. 305).

According to Comerio (1998) disaster in the urban environment is an unintended consequence of development in hazard-prone areas. Hurricanes, floods, tsunamis and earthquakes that occur in non-populated areas are merely natural hazards (See Table 1-2).

Disasters occur when natural hazards take place in densely populated areas (Comerio, 1998). Fischer (1998) sought to differentiate between disaster and emergency and the associated degree of impact and response at federal, state and local levels. For instance, the 1991 tornado that destroyed the homes of 1,000 households in Andover, one-fifth of the community, was declared a federal disaster area. A year later, Hurricane Andrew devastated Homestead, Florida, a community of roughly 100 square miles. Differences in the size and scope of disaster and disaster response have a direct bearing on the needs and resources allocated to a community. These differences are consistent with Fritz's earlier definition that identified the scope of disaster within the subdivision of a community as opposed to large scale disaster areas.

Fritz's definition remains the most comprehensive definition among researchers and has mostly been adopted unchanged (Perry, 2007). Nuances have been added to clarify specific studies while embracing the basic tenets of the original. Buckle (2005, p. 179) includes the *"need for long term recovery"* among the significant and irreversible losses characteristic of disaster. Smith (2005, p. 301) added that disaster events cause *"considerable social, political and economic disruptions"* in the wake of death and destruction. Stallings (1998, 2005) defined disaster as a disruption of nature that interrupts social routines.

Table 1-2: Natural Hazards

Natural Hazards and Geologic Process that Impact Urban Environments	
Earthquakes	Floods
Volcanic Eruptions	Droughts
Tsunami	Hurricanes
Landslides	Tornadoes
Subsidence	Asteroid Impacts

Disasters have also been defined from a geological perspective, which Perry coins the Hazards-Disaster Tradition. Within this system, a disaster is an extreme event that arises when the source, or agent, of disaster collides with a human social system (Perry, 2007). Shadowing the view of Comerio, without human systems in the way disaster would not occur. Mileti (1999) pointed to an overlap between physical, built, and social environments as an encroachment on the natural landscape and subject to the inevitable impact of a disaster event. Cutter (2005) emphasizes human vulnerability and resiliency more so than the disaster event itself.

In lieu of definitions found in the literature, emergency managers are guided by the technical definition contained in the Robert T. Stafford Disaster Relief and Emergency Assistance Act, which reads:

> *"Any natural catastrophe including any hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought, or, regardless of cause, any fire, flood, or explosion in any part of the United States which in the determination of the President causes damage of sufficient severity*

and magnitude to warrant major disaster assistance to supplement the efforts and available resources of States, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby."

Communities faced with the consequences of disaster seek federal aid during the recovery and redevelopment process. The federal definition is significant to this study because this definition establishes the qualifications a community must meet in order to qualify for federal disaster resources.

The disaster declaration process for federal assistance is initiated with a determination of damages by the state (See Figure 1.1). Additional preliminary damage assessments are requested that involve a joint preliminary damage assessment (PDA) process between federal and state agencies. When the PDA is complete, the state determines which counties require assistance and the type of assistance needed. A request from the governor for a Presidential Declaration of Disaster (PDD) is submitted to the regional Federal Emergency Management Agency (FEMA) who reviews and adds additional recommendations before forwarding the request to the national office. The PDD request package is then sent to the President for approval and a signature.

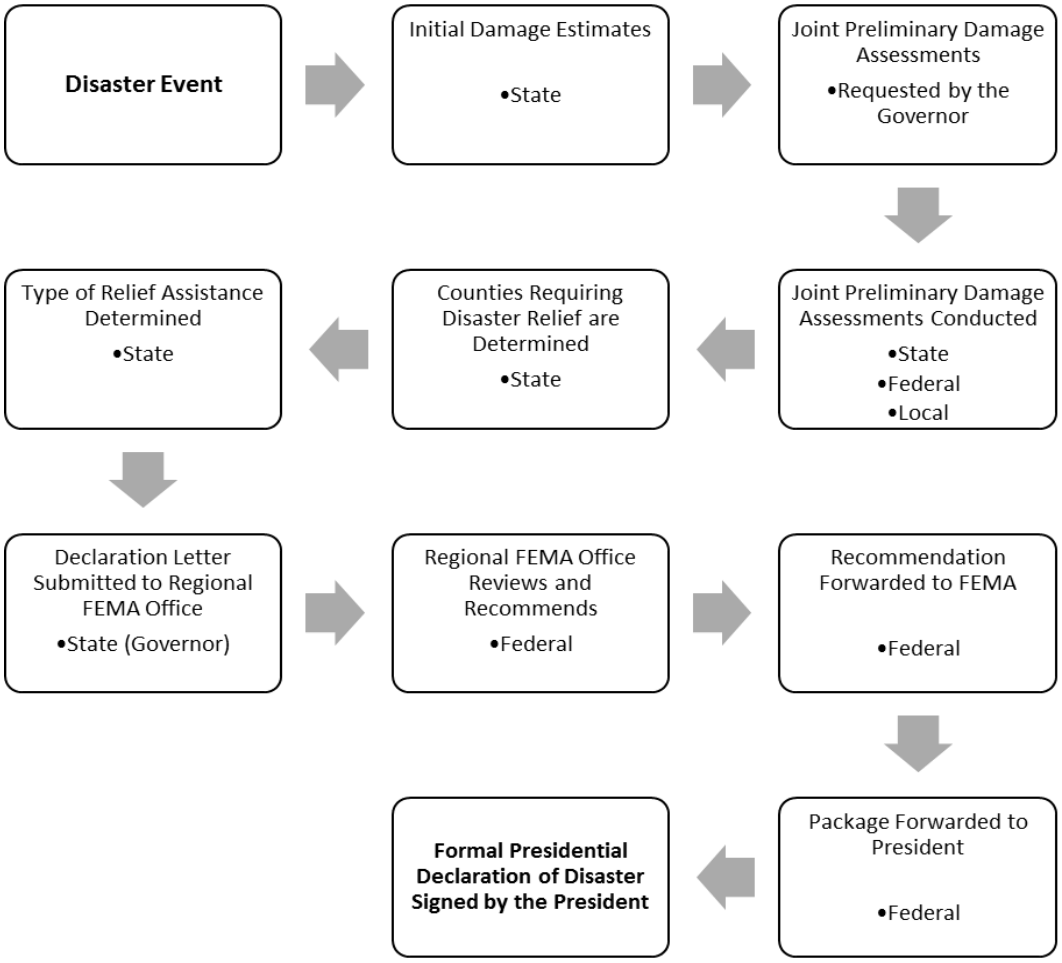

Figure 1-1: Presidential Disaster Declaration Process
Source: Federal Emergency Management Agency (FEMA)

What is Disaster Recovery?

Disaster life cycles are ongoing cyclical progressions that emergency managers distinguish in four to six phases. Disaster recovery is but one phase of the cycle. FEMA has identified four phases of the disaster cycle for emergency management purposes.

These phases are mitigation, preparedness, response, and recovery. Recovery is a unique experience for each community and is influenced by the economic base, extent of losses, and the types of disaster assistance available. The multidisciplinary nature of disaster in academia and in practice poses challenges to the meaning of words and phrases. This section explores the disaster life cycle in order to clarify the meaning of disaster recovery in the context of this study.

The concept of disaster recovery has evolved from the linear process of the mid-1970s to a dynamic phenomenon that responds to the characteristics of the impacted community. The linear process described by Haas and colleagues (1977) posed a static four-stage model that identified the major activities in each stage of the post-disaster period. Disaster is now recognized as a fluid process that is circular in nature. Each stage is also a dynamic course of action with decision-making processes that are related and interactive across stages (Mileti, 1999; Berke and Beatley, 1997; Berke et al, 1993; Rubin, 1985).

Fischer (2008) describes a five phase life cycle of disaster: the pre-impact period, the impact period, the immediate post-impact period, the recovery period, and the long-term reconstruction period. The recovery period is defined as the period in which debris has been cleared, essential services are restored, insurance claims are filed and preliminary reconstruction plans are made. The long-term reconstruction period can extend for years depending on the severity of the disaster event. Long-term reconstruction includes the rebuilding period for housing needs. Hurricane Hugo hit South Carolina in 1989 causing destruction or damage to 108,658 housing units (Rubin

and Popkin, 1990). Nearly 17% of all housing units destroyed or damaged by Hugo were multifamily housing units. After ten months, recovery and reconstruction was barely underway (Fischer, 1998). The recovery process was noted as politically charged with competing interests and demands. Recovery after Hugo was consistent with earlier reflections of Dynes and Quarantelli (1989) who suggested that recovery is often characterized by *"conflicting priorities, by issues of equity and inattention"* (p. 3). Another example of long-term reconstruction took place after Hurricane Andrew devastated Florida. According to Fischer (1998), estimates for the timeframe to complete reconstruction after Hurricane Andrew ranged from ten to fifteen years.

Keim (2011) studied disaster within the field of public health. His research recognized the five phases of disaster within a pre-impact and post-impact cycle. The pre-impact phase includes prevention, mitigation, and preparedness. Post-impact actions include response and recovery. Response and recovery were defined by Keim as *"actions undertaken to minimize loss of life and damage to return to a pre-event status"* (p. 143). Others define recovery as a period of restoration and repair of the built environment within the short and long term phases of disaster (Rubin and Barbee, 1985; Schwab et al, 1998). Nigg (1995) characterized recovery as a social process influenced by pre-disaster conditions and post-disaster response.

Smith and Wenger (2007) adopted a narrative that merged recovery and restoration as conceived by Fischer defining disaster recovery as *"the differential process of restoring, rebuilding, and reshaping the physical, social, economic, and natural environment through pre-event planning and post-event actions"* (p. 238). This

conceptual definition accounts for the technical and social factors that shape disaster recovery (Nakagawa and Shaw, 2004; Nigg, 1995). Recognizing the fluid nature of disaster recovery and reconstruction, the concept of recovery assumes that insurance and recovery funds are applied for and reconstruction is underway. This, combined with Smith and Wenger, form the conceptual definition of disaster recovery that will be used in the context of this research.

Affordable Housing

The most accepted definition of affordable housing comes from the Department of Housing and Urban Development (HUD) and is a reflection of the ability of a household to afford the cost of shelter, including rent or mortgage and utilities. According to HUD, housing is considered affordable if a household pays no more than thirty percent of its annual income toward housing costs (Nguyen, 2005). The idea of rent affordability is straight forward and includes rent and utilities. Affordability for homeowners is more difficult to ascertain because of mortgage interest deductions, real estate tax deductions, and capital gains (Schwartz, 2014). This study focused on rental housing rather than home ownership except to point out programs that favor owners during recovery rather than supporting multifamily housing restoration and production

Other terms, such as below-market or low-income have been suggested as better alternatives to affordable housing, but these terms also have their limitations. For example, Section 8 voucher recipients do not necessarily rent below-market housing units. Their units tend to be rented at market and vouchers are used to subsidize rent based on the tenants' income, usually capped at thirty percent. Tenants pay the

difference between the voucher and the landlord's market rent. The term low-income is also problematic because it requires some sort of threshold or cutoff. Some have argued for more sophisticated measurements of housing affordability, such as a sliding scale that accounts for the number of people in the household as well as their income (Stone 1993; Stone, 2006).

Working definitions of affordable housing have been attempted by others (Freeman et al., 1997; Chaplin and Freeman, 1999) but there is no generally applicable definition since the term *"affordable housing"* might mean different things to different interests (Miles et al., 2000). Affordability is typically defined by the relationship between a household's expenditure for housing costs, including utilities, and income. A large number of communities are experiencing a shortage of affordable housing, often as a result of the disinvestment in public housing or low income growth in the macro economy. Lack of affordability becomes a larger problem for many communities even after disaster recovery and housing reinvestment. The problems of affordability often escalate after disaster, becoming even more widespread during recovery as housing shortages develop (Comerio, 1998; Levine et al, 2007).

Affordable housing can also be thought of as physically adequate housing that is made available to those who could not afford the rent for such housing without some special intervention by government or special arrangement by housing suppliers (Field, 1997). Special interventions include rent subsidies through Section 8 vouchers, sliding scale rents based on income, income and rent caps, such as with rental housing constructed using Low Income Housing Tax Credits (LIHTC), or other arrangements that

subsidize or reduce conventional rents found in the marketplace. In addition to subsidies provided to renters, developers can also apply for incentives to reduce construction costs. These incentives include creative financing, waivers of land use requirements, or special exceptions to building regulations. Homeowners are also given special interventions such as favorable lending terms or financial assistance for reconstruction.

The Center for Housing Policy found that 24.5% of renters and 18.6% of homeowners were severely cost burdened, meaning more than half of household income is spent on housing costs (Viveiros and Sturtevant, 2014). A severe cost burden means that more than half of household income is committed to the cost of housing. Cost burdened renters also have an affordability crisis. Thirty-two percent of moderate income households are cost burdened, paying more than thirty percent of household income on housing (Hickey et al., 2012). For the purposes of this study, affordable housing was defined using the standards most often cited in the literature and accepted by most government agencies. Housing is considered affordable when rent and utilities are no greater than 30% of area median income (Salama and Alshuwaikhat, 2006; Somerville and Mayer, 2003).

The Low Income Housing Tax Credit

This study was specifically interested in how participants of LIHTC respond to risk during disaster recovery. Participants include developers, financiers, managers, or others involved with the production of affordable housing under the program. Established by the Tax Reform Act of 1986, the LIHTC program has become the *"single largest subsidy for the production of low-income rental housing"* in the country

(Schwartz, 2014, p.135). The program provides tax credits as an incentive for private investor participation in the production of low-income rental housing. LIHTC is included in the tax code of the Internal Revenue Service and, as of 2011, has been directly responsible for more than 2.5 million housing units.

Other programs exist that are also used for affordable housing production. Funds allocated under the HOME Investments Partnership Program (HOME) and Community Development Block Grant (CDBG) are sometimes combined with LIHTC to make the developments economically feasible. HOME and CDBG funding is provided to the state based on a Consolidated Plan (CP) required by the Department of Housing and Urban Development (HUD). The CP is a statewide five-year plan that guides general long term strategy to meet expected housing needs using a market centered, data driven framework. The goal of the CP is to identify housing priorities and is required by HUD when state housing authorities allocate CDBG and HOME funding.

LIHTC relies on a Qualified Action Plan (QAP) to set out housing preferences of the state, usually through the state housing authority. The QAP often uses a scoring system or sets thresholds based on the priorities of the state specifically for LIHTC developments. CDBG and HOME funds are not tied to LIHTC or the QAP, however the housing authority as the issuing agency may include provisions that allow for or encourage the use of CDBG and HOME funds. During disaster recovery, additional funding sources may be offered at federal, state, and local levels to facilitate the recovery effort. Some of these sources include disaster mitigation grants, SBA loans, and federal disaster loans.

Tax credits are allocated to housing authorities by the IRS on a per capita basis. Housing needs are generally reflected in the QAP which informs housing producers of state priorities for LIHTC developments. Points are used to score applications received developers who compete with others for tax credits during the annual application period. There are a limited number of tax credits available and the application process and paperwork requirements are expensive and time consuming. In spite of the complexity of the annual application process, it is not uncommon for there to be more developers interested in the program than the available number of tax credits can accommodate. For this reason, housing authorities are likely to award credits to developers that provide the greatest number of housing units meeting the priorities expressed in the QAP. Some states incorporate flexibility in their decision-making while others make decisions based on score totals.

Investor Participation in LIHTC

Tax credits are distributed annually by the IRS on a per capital basis (See Figure 1-3). State housing authorities award credits to LIHTC developers in a competitive environment. Winning LIHTC developers offer the tax credits to investors either directly or through a syndicator who acts as a middle man to bring developer and investors together. Most investors are corporations or entities that benefit from the tax advantages offered by tax credits. A syndicator bundles tax credits into investment packages that provide equity to the developer. Developers finance the remainder of the project from other housing programs and through traditional financing. Investors can use tax credits to lower taxable income dollar for dollar however these benefits cannot proceed until the development is completed. Tax benefits are applied over a 10 year period. The developer and any subsequent must owner agree to monitor compliance for 15 years and since 1990, units must remain affordable for 30 years. Investors of properties that are not in compliance during the 15 year reporting period face severe penalties, so the incentive to maintain affordability is strong.

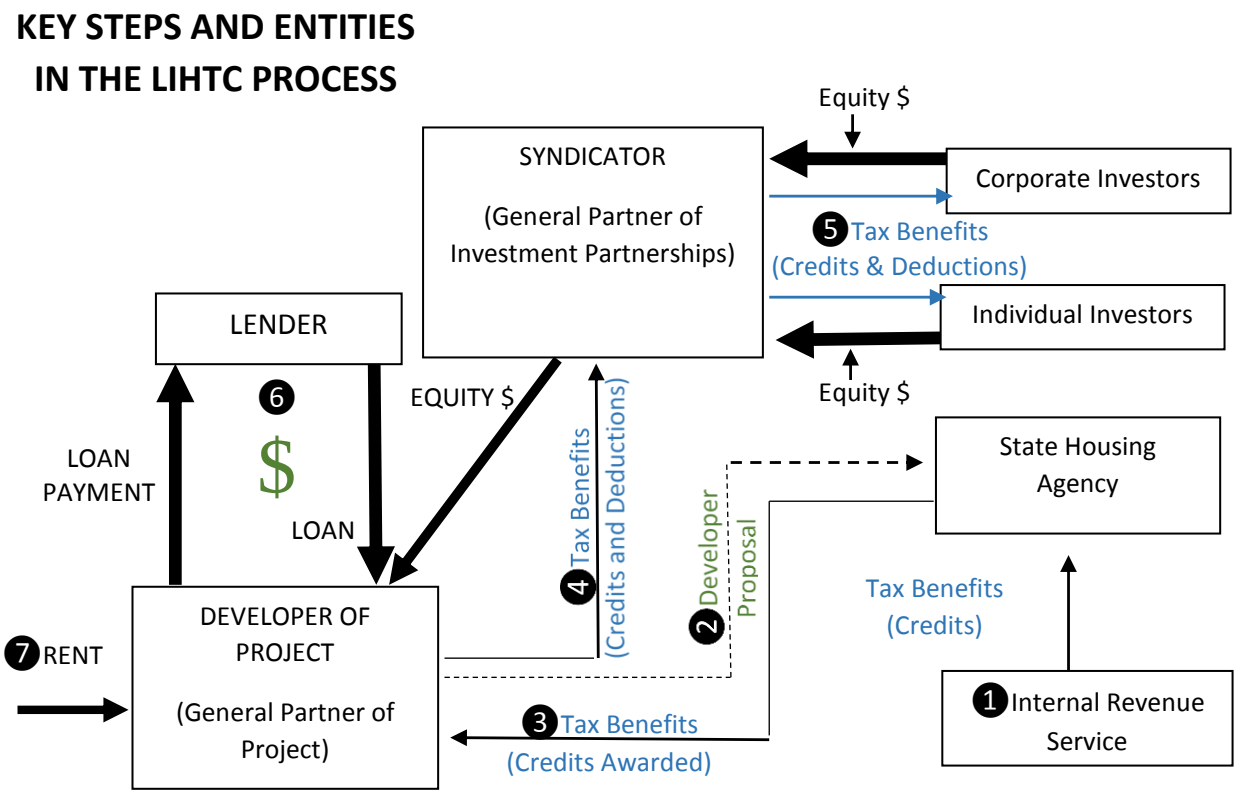

Figure 1-2: LIHTC Funding Process
Source: Modified from a diagram prepared for Congressional testimony (see GAO/T-GGD/RCED-97-149); also see Danter Company, Follow the Money: How the LIHTC Program Works

Risk in Context

The scholarly work in the field of risk is extensive and encompasses many fields. Early studies in the 1950s were developed from the concerns associated with early industrial technologies in engineering, chemicals, and nuclear power (Lofstedt and Boholm, 2009). Initial risk research identified public perception of risk and has since evolved to the study of underlying issues that address equity, trust and power (Slovic, 2000). Risk literature comes from a wide range of fields including toxicology and health, public policy, and technology among others (Slovic, 2000). The literature for this study focuses on risk in the context of natural hazards in the field of social science. In the social sciences, Gilbert White initiated risk studies in the context of natural hazards with his 1945 study, *Human Adjustment to Floods*. White argued that modifying human behavior is a more effective means of mitigating risk from disaster than engineering solutions (p.188).

Risk is often studied in the context of hazards, and by default, disaster (Smith, 2013). Smith defines risk as *"the actual exposure of something of human value to a hazard and is often measured as the product of probability and loss"* (p. 11). When a hazard, which Smith defines as *"a potential threat to humans and their welfare arising from a dangerous phenomenon or substance that may cause loss of life, injury, property damage, and other community loss or damage,"* is combined with risk, the definition becomes more precise. A hazardous risk is defined as the *"combination of the probability of a hazardous event and its negative consequences"* (p. 11).

The intent of this study was to understand how a segment of real estate developers, those participating in the LIHTC program, perceive risk associated with disaster recovery in coastal communities and how risk perception influences development decisions. Variables of risk were identified in the literature and from a survey of multifamily housing professionals who participated in the LIHTC program in Florida between 2000 and 2010. Perceived risks have been categorized and ranked according to stated preferences from the LIHTC developer community and are discussed more fully in Chapter 5.

Chapter 2

CONNECTING HOUSING, DISASTER, AND POLICY

WHY AFFORDABLE HOUSING?

Current U.S. housing policy has failed to alleviate the housing cost burden faced by middle and low income households. Failure on the part of the U.S. housing safety net often has severe consequences. Within any given 24 hour period, over 610,000 people experience homelessness (Henry et al., 2013). Households who struggle with rent experience more stress resulting in high blood pressure, depression, and anxiety. Low-income households often occupy low-quality housing exposing children and adults to potential allergens, lead paint, and unsafe conditions (Cohen, 2011).

In 2013, the U.S. Census reported that 14.5% of the population lives at or below poverty (DeNavas-Walt and Proctor, 2014). The federal government measures poverty using poverty thresholds and poverty guidelines. Poverty thresholds are updated annually by the Census Bureau and are the original measure of poverty used mainly for statistical purposes. Poverty guidelines are issued by the Department of Health and Human Services and are published annually in the *Federal Register*. Poverty guidelines are a simplified analysis of poverty thresholds and are used to determine financial eligibility for federal programs, including housing subsidies. Guidelines are calculated using the published weighted average poverty thresholds and the Consumer Price Index for All Urban Consumers (CPI-U). Three sets of poverty guidelines are issued. One set includes guidelines for each of the 48 contiguous states and Washington D.C., one set is issued for

Hawaii, and one set is issued for Alaska. In the contiguous states and Washington D.C., 2013 poverty guidelines indicate that a single adult earning $11,490 or less is considered to live in poverty. An annual income of $23,550 is considered poverty for a family of four (HHS, 2013). These figures are higher in Alaska and Hawaii. In 2013, more than 45 million people, or 14.5% of the population, lived below the poverty level. Poverty has a direct effect on housing affordability and is linked to housing cost burdens causing distress for 13% of the population.

Cost Burden and Housing Affordability

Housing affordability is discussed in terms of housing cost burden. A housing cost burden is defined by the Department of Housing and Urban Development (HUD) as paying more than 30% of household income on costs for shelter including utilities. A severe cost burden occurs when households pay more than fifty percent of gross income on housing costs. According to Schwartz (2015), housing affordability is a bigger problem than inadequate or overcrowded housing. In the past, overcrowding and inadequate housing were a major concern. Today, fewer than 2% of households reside in inadequate housing (Schwartz, 2015, p. 32). Overcrowding accounts for less than four percent of households. In contrast, more than 18% of households spend at least half of their income on the cost of housing (p. 32). Thirty-five percent are renters and 27% of these spend more than half their income on rent (JCHS, 2013).

Multifamily Housing in the US

Multi-family housing accounts for 26% of all housing units. According to the National Multifamily Housing Council, a primary resource for multifamily insight, in 2013 apartments encompassed 42% of all housing units providing shelter to over 16 million households. There were 3,375,747 apartments constructed between 1990 and 2011. Forty-two percent of the households in these newer properties have an annual income below $20,000 per year.

The National Multifamily Housing Council estimates over 16 million apartments exist nationwide. According to HUD, nearly two and a half million units have been built with LIHTC since 1987. This accounts for between 12% and 15% of new and rehabilitated apartment units throughout the country[1]. More than 12% of the U.S. population lives in multifamily housing. The greatest percentage of apartment dwellers lives in the District of Columbia followed by New York. In Florida, more than 12.4% of the population, or 2,380,131 residents, live in an apartment (NMHC, 2013). Florida has the 13th highest number of residents living in multifamily housing.

Understanding LIHTC

The LIHTC program was created under the Tax Reform Act of 1986 and has become the nation's primary program for financing affordable rental housing (Wallace, 1995). The goal of the program is to provide an incentive for private investment in

[1] Calculated from NMHC estimate of U.S. multifamily units and the number of LIHTC units placed in service between 1987 and 2011 stated by HUD. Joint Center for Housing Studies tabulations are based on the LIHTC database which reports fewer units than the number estimated by the NMHC

affordable housing intended for households earning less than 50% or 60% of area median income (AMI). The program supplements existing appropriations for public housing and rental assistance programs that are administered by the Department of Housing and Urban Development (HUD). LIHTC is the only production program for affordable and low-income housing in the country. Since its inception, the program has supported private funding for the construction of more than 2.4 million multifamily housing units (HUD, 2015). Tax credits are purchased by investors at a reduced rate as an incentive to fund LIHTC development. Tax credits can then be used to reduce annual income dollar-for-dollar in an amount equal to the initial investment divided equally over a ten-year period.

To qualify for the tax credit, LIHTC owners commit to setting aside at least 20% of all units for households that earn 50% of area median income (AMI) or 40% of units are set aside for households earning 60% of AMI. This is referred to as the 20/50 and 40/60 rule. Rents are targeted to not be more than 30% of household income however rent is based on AMI rather than household income. Tenants often find that because rent is not income based, housing costs exceed the targeted percentage for affordability. Units must continue to remain affordable for a 15 year compliance period, and since 1990, for an additional 15 years[2] or investors will forfeit earned tax credits retroactively by recapture. The penalty is intended to be severe in order to enforce compliance.

[2] Properties must report compliance annually for the first 15 years. After 15 years, owners are no longer subject to compliance reporting and under certain conditions, may opt out of the program. If an owner

The LITHC program has been criticized by the private sector for its complexity and high transaction costs. In the few years after the program was initiated, Clancy (1990) wrote the bureaucracy within the program was complicated with extensive reporting requirements and procedures for documenting compliance was cumbersome. Stegman (1992) initially complained that underwriting was unnecessarily complicated and burdensome but later pointed to the efficiency of the program because of the portion of credit dollars going to the bricks and mortar of development rather than the administrative costs of syndication and managing investor returns (Stegman, 1991). Postyn (1994) noted that few incentives existed for developers to participate in mixed-income developments because of cumbersome regulatory requirements implying fewer affordable units available for low-income households.

Recent studies have concentrated on cost burdens and the affordability of rent. Williamson (2011) examined 38,000 LIHTC households and found that 76.2% of LIHTC households were cost burdened and 15% were severely cost burdened. Households using vouchers in conjunction with LIHTC were also cost burdened although to a lesser degree. More than 35% of LIHTC households using vouchers were found to experience housing cost burdens, paying more 30% of household income for rent. These statistics demonstrate that LIHTC is not a guarantee of affordability and often fails to reach extremely low income households who often have the greatest need for affordable

---

wishes to opt out, the state housing agency must be notified and given a year to find a qualified buyer. If a qualified buyer is not found, the owner may be released from future restrictions and obligations under LIHTC.

housing. The program does not specifically target households with extremely low incomes nor are rents assessed on a sliding scale according to income.

Regan and Horn (2013) found most LIHTC households have higher incomes relative to other affordable housing programs, but 45% of tenants had extremely low incomes, meaning income is at or below the federal poverty guidelines or is 30% below AMI[3], whichever is greater. This number corroborated an earlier study by New York University that found 43% of LIHTC households had incomes below 30% AMI. According to Hollar (2014), over half of all LIHTC tenants pay less than 30% of their income on rent and three-fourths of tenants spent less than 40% of their income on rent. Severe cost burdens are experienced by 10% of LIHTC tenants who pay more than 50% of their income for rent. Developers often apply for additional subsidy programs to reduce development costs in order to serve lower income households. These efforts are credited for relieving cost burdens for 31% of extremely low income renters in the program (JCHS, 2013).

Housing cost burdens for states are uneven. Some states, such as Rhode Island and Washington, have more than 80% of LIHTC households who are not cost burdened at all. On the other hand, 31.7% of LIHTC households in Oregon and 32.7% in Arizona pay more than 40% of income in rent. Severe cost burdens for these two states are 18% and 20.4% respectively (Hollar, 2014). In Florida, the subject of this study, 40.1% of

[3] 2013 AMI were found at the Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation website. The poverty guidelines are updated periodically in the *Federal Register* by the U.S. Department of Health and Human Services under the authority of 42 U.S.C. 9902(2).

LIHTC households pay less than 30% of household income on rent and are not experiencing cost burdens. There are 25.7% of households paying greater than 40% of income on rent. More than ten percent of these are severely cost burdened paying greater than 50% of household income on housing costs (p. 27).

As mentioned earlier, rents in LIHTC units are capped at thirty percent of either 50% or 60% of AMI depending on the developer agreement. Rents often fluctuate with market conditions. Because rents do not fluctuate with tenant income, tenants who experience job loss or a reduction in income are obligated to pay the contract rent. Even though LIHTC households earning 50% to 60% of AMI are better able to avoid cost burdens (Williamson, 2011), evidence suggests that LIHTC does not alleviate the cost burden associated with rental housing.

While the LIHTC program does produce additional affordable units, affordable housing shortages persist in many communities. According to the Institute for Children, Poverty, and Homelessness, the number of households living in poverty has increased while at the same time the number of affordable rental housing has declined. Higher income households occupied nearly 42% of all affordable housing units, pushing over half of low and extremely low-income families into unaffordable rental units[4]. The Joint Center for Housing Studies (2012) found that over the past decade, the gap between the supply and demand for low income rentals has widened over the past decade. Since the

[4] U. S. Census Bureau (2009), American Community Survey.

Great Recession of 2008, declining household income has increased demand for affordable rental housing for higher income tenants pushing the lowest income tenants into less desirable housing.

AFFORDABLE HOUSING, LIHTC AND DISASTER RECOVERY

The supply of low-income housing incurs additional production challenges in the face of disaster. The effectiveness of housing programs as a solution for problems caused by disaster has been examined by others. Gotham and Greenburg (2008) applied a comparative analysis of Community Development Block Grants (CDBG) and local bonds after 9/11 and Katrina. Their analysis revealed the overwhelming influence of business interests that dominated the political discourse, and ultimately influencing rule changes that eliminated the 'public benefit' language previously contained in the provisions. Green and Olshansky (2012) studied the Road Home Program (RHP), one of the largest disaster programs implemented during Katrina, highlighting program volatility and implementation challenges. RHP was created in the wake of Katrina to provide aid to small rental properties and to offer homeowners a choice to sell out or rebuild.

During the recovery period, redevelopment shadows economic development policies that currently encourage development of mixed use neighborhoods to dilute pockets of poverty associated with public housing. Other policies attempting to alleviate poverty have also prescribed location or development priorities. In the early 1990's, the Moving to Opportunity program and the HOPE VI program were introduced in an effort to disperse public housing residents into other neighborhoods so that impoverished families could integrate into more middle-class communities (Goetz, 2004). Efforts to

de-concentrate poverty was also attempted by combining LIHTC with other federal assistance such as HOPE VI[5], HOME, vouchers, and other low-income housing programs (Graham, 2012; Schwartz, 2010). According to Goetz (2004), HOPE VI was criticized for focusing on development for middle class families rather than housing low-income households. The failure of HOPE VI became evident when the negative impact of de-concentrated policy and construction of mixed use developments was criticized widely during recovery after Hurricane Katrina. The City of New Orleans demolished over 4,500 public housing units and replaced only a fraction of them using HOPE VI for mixed-use development. More than 142,000 housing units were damaged or destroyed because of Hurricane Katrina, 79% of them considered to be affordable; by 2008, just 3 years after the storm, only 8,900 affordable housing units had been funded (Dianis and Sinhha, 2008), well under the number needed to house displaced low-income households.

Much of the literature related to disaster recovery and housing examines the impact on those who either receive housing services or are displaced due to shortages of available housing (Mueller et al., 2011; Tierney, 2006). Spangle (1991) primarily studied technical strategies for recovery, but recognized the disproportionate displacement of low-income households as a result of damaged housing and the subsequent increase in rents as a result of higher costs for code compliance during recovery.

[5] HOPE VI was implemented in 1992 to encourage redevelopment of severely distressed housing developments.

The evidence of an overall reduction in the number of low-income rental housing units during disaster recovery has been well documented (McCarthy and Hanson, 2008; Unity, 2010), however Vuk (2008) suggests that this view is misleading. His case study explored commentary from advocates of public housing preservation in the aftermath of Katrina. Vuk (2008) found that low-income households in New Orleans were misled about available housing. One of the reasons for his claim is the availability of vouchers. Housing choice vouchers are a demand subsidy provided to qualified households allowing them access to affordable housing from the private sector. Privatization proponents have long called for vouchers as a more viable alternative to housing low-income populations as opposed to government incentivized housing (Savas, 1987; Savas, 2000).

The experience of LIHTC housing providers participating in disaster recovery have not been given much attention. Most studies and essays bemoan the failure of LIHTC, and other housing programs, to reach those most in need (Hooks and Miller, 2006). Still others have used geographic information systems (GIS) to analyze damages and losses of housing, including LIHTC, after Hurricane Katrina (Richardson and Renner; 2007). This study specifically examines the preferences of LIHTC professionals and the Florida State Finance Corporation (FHFC), the state housing authority administering housing programs in the state. Research on LIHTC multifamily housing development post-disaster fills a gap between the disaster experience of households and housing providers, particularly LIHTC developers and investors.

PREFERENCE THEORY, DECISION-MAKING, AND RISK

As stated in Chapter 2, risk as a social science was first explored by Gilbert White (Lofstedt and Frewer, 1998). White proposed a social construct that suggested modifying human behavior was a better solution to potential harm from natural disasters (White, 1945). Avoidance is one such measure. Risk avoidance is most often shown in areas with proximity to hurricane hazards, such as Florida, when communities mandate evacuations or have a no-development policy on barrier islands.

Bradbury (1989) identified two concepts of risk that propose solutions to different problems. Technological risk uses a quantitative approach in risk analysis and presents facts from which decisions can be made. Most attention to property development risk focuses on measurable processes, largely feasibility analysis and cash flow analysis (Byrne, 1996; Cadman and Topping, 1995). Additional risk exposure for LIHTC projects (management risk, tax risk, and capital risk), are quantitative and fall within the technological risk category. A second concept of risk forms a theoretical basis for policy design from a social constructivist perspective (Bradbury, 1989, p. 380). It is from this perspective that societal decisions can be considered and cooperative decisions can be made.

Plough and Krimsky recognized the significance of the political dimension of policy formation when *'what the experts deem most important and what the public demands from government'* are in disaccord (1987, p. 7). Often this is the case when disaster recovery is underway, yet social needs fail to be met. Disaccord is highly visible in the affordable housing realm, not only because of a chronic undersupply in general, but

especially when disaster recovery fails to address the needs of the most vulnerable segments of the population—the elderly, disabled, and impoverished. Bradbury (1989) includes an ethical dimension to consider *'questions of values that inherently are embedded in judgments of the analyst'* (p. 382). Risk judgments between laypersons and experts will naturally have differing viewpoints because each class has varying experiences and expectations that contribute to understanding. Disagreements between experts and laypersons are not factually wrong per se but are from a different perspective (Fischcoff et al, 1983). The literature on disaster recovery reflects this discord with the majority of research focusing on the effects disaster places on the displaced and the disenfranchised. The conversation ultimately leads the charge for more assistance and more housing that is affordable for the poor and working classes, often to no avail. Research devoted to those who provide affordable housing fails to examine the problem from the producer's perspective. Developing an understanding from the perspective of one or another group provides the foundation for a two-way conversation that supports knowledge and mutual respect (Bradbury, 1989). This study bridges the gap between the perspective of the developer and the multiple studies that advocate for increased access to affordable housing by vulnerable households.

Slovic et al (1979) found in an earlier study on hazards related risks that people who had faulty perceptions were likely to err in their understanding. That challenge is still prevalent today. Understanding barriers to the development of affordable housing as heard from those that produce housing with LIHTC will hopefully contribute to the discourse in the literature and in public policy.

LOCATION PREFERENCE AND DEVELOPER RISK

While some developers may consider the social benefits of their developments, for the most part, real estate developers are concerned with exposure to financial risk when making investment decisions. Empirical evidence identifies real estate risks as illiquidity (the inability to turn real estate into cash quickly), optimal holding period, price risk (Cheng, Lin & Liu, 2008); interest rate risk (Archer, Elmer, Harrison & Ling, 1998); credit and debt burden risks (Igan & Pinheiro, 2010); and risk associated with business cycles (Igan & Pinheiro, 2010). Traditional aspects of development risk, such as financing and interest rates, have been studied by Markham (2001) and Cameron (1990). Additional risks identified by Liu, Liu & Sun (2011) include policy risk, funding risk, operational risk, urban planning risk, technology risk, natural hazards risk, market supply and demand risk, and capital risk.

Newell and Steglick (2006) identified property development risks in a survey of leading property developers in Australia. The major categories of risk factors in this study were categorized by stages of construction and included risk factors such as costs, land, financial, infrastructure, management, time, changes, and environmental factors among others. Their survey of property developers indicated that the pre-construction phase of development has the highest overall risk in the development process. Risk factors for this stage include many of the same risk factors that would take place during post-disaster redevelopment: political risk, experience, funding, market risk, land acquisition, and government approvals. Some of these same risk factors were verified by this Florida LIHTC case.

Risk factors were categorized in the course of this study. Dullisear (2001) classified property development in four broad risk categories: commercial, construction, land, and social. Hargitay and Yu (1993) identified two categorical types of risk as systematic and unsystematic. Systematic risk was defined as an external risk that cannot be controlled such as general economic changes, changes in government policies, market risk, and cyclical risks. Unsystematic risks are specific risks that can be anticipated, for instance business risk, liquidity, location, construction, and financial risks. Pidgeon et al (1992) studied risk perceptions through the dichotomy of objective and subjective, or perceived risk. Objective risk is specific and measurable while subjective risk is what an individual perceives based on personal experience and expectations of an occurrence.

Building on Morrison's (2007) use of Social, Technological, Economical, Environmental, and Political (STEEP) analysis in real estate development, Khumpaisal and Ross (2007) used STEEP analysis for categorizing real estate development risks that are both quantitative and subjective. STEEP analysis is a strategic decision-making tool that allows an organization to assess potential changes to the current macro environment. The method is also known as ETPS, STEP, PEST, PESTLE, and STEEPLE. Various iterations of this business model consider other factors that influence decision-making, such as Legal (L), Political (P), Economic (E), Environmental (E), Technological (T), or Sociological (S). This study used a modified STEEP analysis to isolate those factors specific to real estate development in the aftermath of disaster. The categories chosen for this study were Social, Technical, Environmental, Economic, and Government (Table 2-1).

Table 2-1: STEEG Analysis Categories for Real Estate Development During Disaster Recovery Modified from Khumpaisal and Ross (2007)

STEEG Analysis Categories for Real Estate Development During Disaster Recovery	
Social	Social factors include community feedback for real estate development projects. This feedback could be in the form of pushback based on existing bias towards a particular type of development or demand for a specific type of construction. Social factors are identified as external threats or external allies to a project.
Technical	Technical factors include factors that indicate financial feasibility for a project. This includes measurements of feasibility such as cap rates, internal rates of return, operations, and financial strength.
Economic	Economic factors involve the profit and loss of a given development and include available funding, incentives, subsidies, and application costs that have a positive or negative influence on profitability.
Environmental	Environmental factors include those elements that influence where a project will be developed in conjunction with known or perceived natural or human made hazards.
Government	Political factors are those governmental influences that are outside a single developer's influence. These include the likelihood of existing policies to continue, funding based on a political agenda that could expire depending upon which group is in power, or priorities based on needs at the federal, state and local level.

Identifying LIHTC Development Risk

In addition to traditional real estate development risks, LIHTC in particular carries management and recapture risk due to complicated management and reporting requirements (Roberts, 2009). Recapture risk occurs when the required number of low-income units is not maintained, resulting in tax credit recapture from the investor back to the state.

Reznick examined operating data for 16,356 tax credit properties and found that foreclosure risk among LIHTC is less than 1% even though cash flow margins were tight (2011). Nearly 35% of properties surveyed were operating below the break-even point demonstrating the significant contribution of subsidies to project feasibility. Only one study was found that analyzed the effects of disaster specifically on LIHTC properties. After Hurricane Sandy, the Furman Center at New York University conducted a count of housing damages by type, including LIHTC. Of 178,000 affordable housing units damaged by storm surge, 248 buildings with 24,800 units were identified as LIHTC (2013). Considering the low margins achieved by LIHTC, damages to units after disaster could increase the incidence of foreclosure if damaged units cannot be brought back online in a reasonable amount of time. Cost risks can cause a negative impact on performance if rehabilitation falls below the break-even point for operations. After disaster, the risk of recapture due to a brief noncompliance period from the down units is somewhat mitigated because the IRS typically waives compliance requirements, at least temporarily, during the response and restoration period. When foreclosure occurs, IRS rules state that the extended compliance period is waived and recapture is mitigated under

the assumption that a subsequent owner will continue affordability status. One of the limitations the earlier study is that LIHTC foreclosure rates could be understated because deeds in lieu and syndicate support of underperforming properties was not analyzed (Reznick, 2013).

Melendez, Schwartz, and Montrichard (2008) found that LIHTC capital risk increases as LIHTC properties age and need rehabilitation. Often, older developments that have completed the initial compliance period and the extended compliance period use LIHTC funds to upgrade properties and maintain affordability. After disaster, rehabilitation creates risk because of the additional financing needed to restore and repair units after disaster.

Strategies for managing private sector risk as a tool for mitigation have received some attention in the literature. Harrington (2006) uses economic theory to propose catastrophic risk insurance while Kunreuther (2006) uses risk decision theory to argue for a comprehensive natural disaster insurance program. Both of these ideas are likely to increase developer costs, becoming a barrier for participation because of the tight margins of profitability associated with LIHTC.

A list of objective and subjective risk variables was compiled from the real estate development literature and the reflections of this study's survey respondents. Risk variables were categorized using the modified STEEP analysis described previously (see Table 2-2). Some elements of risk that directly affect hurricane prone areas, such as storm surge, coastal proximity, impact zone, or specific programs associated with housing and disaster recovery were included. Phase II of this study asked developers

about elements of risk in order to identify those risk factors that affect decision-making. Developers contributed two additional funding sources to mitigate financial risk, Project Based Section 8 Rental Assistance and State Housing Trust Funds. Respondents also ranked a series of risk variables that reflected perceived risks associated with hurricane disaster.

After disaster, risk perception could influence recovery decision-making, particularly if decision makers experienced significant losses. Location and land availability are key factors for development decisions and both factors are significant barriers to development in high cost/high hazard coastal counties. Land acquisition cannot be financed with LIHTC investment funds, so the developer either acquires land for a specific project, or has land readily available from previous investments (Nelson, 2014). The price of available land is basic to any investment decision. Oftentimes the least expensive land is located in the most vulnerable of places (Khadduri, 2013). Land in coastal communities often comes at a premium. Higher rent and higher stabilized occupancy rates offset high land costs in these areas (Bin and Kruse, 2006). Site decisions are also influenced by access and the available market, which increases value and cost. After disaster, particularly those disasters that have devastating outcomes on resources, developers are especially cognizant of market rebound and future risk due to hazards. Available land in a high impact disaster area could present barriers to a subsequent purchase

Table 2-2: Modified STEEP Analysis

Florida 2004 Case Study Criteria: A SEEP Method for Categorizing LIHTC Risk During Disaster Recovery			
Social	***Environmental***	***Economic***	***Political***
NIMBY	Location	Recapture	Government Priorities
Advocacy Groups	Storm Surge	Financing	Policy Consistency
Public Sentiment	Coastal	Incentives	Regulation
	Impact Zone	Grants	Funding
		CDBG	Grants
		HOME	Disaster Funds
		Insurance	
		Capital Costs	
		Land Acquisition	
		Terms	
		State Housing Trust Funds	
		Project Based Section 8	

households who need shelter temporarily as a response to disaster. In this study, some developers expressed a preference for risk avoidance in the areas likely to be hardest hit based on perceived location hazards. While no direct evidence exists, in the course of this study developers communicated the perceived risk of a slow rebound in some communities, if the area rebounds at all. Lack of redevelopment after Katrina, particularly in some of the lower-income communities suggests that perceived risks associated with a slow rebound are well-founded.

Developers of low-income housing often face NIMBYism (Not in My Back Yard) from communities resistant to the perceived risk of the decline of property values because of the proximity to low-income housing. While this study found that advocacy was not exceedingly significant in development decision-making, developers suggested that local communities be better informed about the typical tenant occupying LIHTC in a rebranding attempt to reduce the stigma associated with affordable housing. Excessive costs for insurance, code compliance, or proximity to hazards shape investment decisions from an opportunity cost or development cost basis.

Location Preferences and the Public Agency

Statute requires that state housing authorities (HFA) develop annual Qualified Action Plans (QAP) to encourage a wide variety of stated preferences for LIHTC development. The QAP is a federally required planning tool that HFA uses to explain how the LIHTC program will be administered, and to establish preferences and set-asides for tax credit awards (Hollar, 2014). Allocation criteria is determined by the state, however the statute specifically requires certain criteria to be considered, including

location, which is the primary interest for this study. Other required features and conditions are shown in Table 2-3. Public policy preferences are communicated in QAPs in several ways. Preferences in the form of extra points encourage developers to submit projects that favor specific populations, such as the elderly, disabled, or families; extra points may also be awarded to encourage projects in certain locations. Others use thresholds and set asides. Others, like Florida, use specific language, such as 'targeted'.

This study specifically examined location preferences for areas affected by the 2004 hurricane season. That year, four hurricanes hit Florida causing some degree of damages in every county. Hurricane Charley was the first to strike on Florida's east coast beginning a 44 day onslaught of damaging winds, rain and storm surge. Charley was followed by Hurricanes Frances, Ivan, and then Jeanne. Some areas were hit by multiple hurricanes. Other areas had damage associated with storm surge. In the two years after the hurricanes, Florida QAPs responded with location preferences which will be discussed in further detail in Chapter 5.

Table 2-3: Allocation Criteria for Qualified Action Plans

LIHTC Qualified Action Plan Criteria	
Project characteristics	Lowest income populations
Housing needs	Tenants with children
Project location	Qualified Census Tract
Revitalization plan	Participation non-profit organizations
Sponsor characteristics	Energy efficiency preferences
Special needs tenants	Historic properties
Public housing waiting lists	Projects intended for eventual tenant ownership

Set-asides are one means of communicating LIHTC preferences. These can be established within the QAP reserving a dollar amount or a percentage of tax credit allocations for projects meeting specific guidelines, for populations served or location preferences for example. Thresholds can also be established that require projects to meet minimum guidelines just to submit a proposal for LIHTC awards. Gustafsen and Walker (2002) performed a content analysis of QAPs from 1990 to 2000 to determine how preferences and set-asides were used to guide development characteristics. They found that set-asides and preferences were declared in eight categories: geographic location, housing needs, financing, residential characteristics, project type and activities, building characteristics, sponsorship and costs, and affordability. Others have found that location

requirements result in LIHTC developments often being supplied in low-income areas with housing already relatively easy to obtain using vouchers (Eriksen and Rosenthal, 2010). Some studies suggest LIHTC developments often act as a substitute for market housing that would have been constructed without tax credits or other subsidy (Eriksen and Rosenthal, 2010; Malpezzi and Vandell, 2002). Given that developers are less likely to build LIHTC in areas with less demand, like extremely low-income communities, QAPs that award additional points or set-asides for these areas can result in LIHTC being developed in areas that already support low-income households considering that rents are relatively cheaper and landlords are likely more willing to accept vouchers (Baum-Snow and Marion, 2009).

According to Khadduri (2013) developers actively communicate during the comment period for QAPs being commenced the following year to influence which projects will be fundable. Preferred locations established in the QAP do not necessarily insure developers will bring properties into the LIHTC competition (Khadduri, 2013). For instance, threshold requirements may negate additional points awarded for location obstructing competitiveness of certain properties. High land costs also impede developer activity in more desirable areas that are often experiencing a decline in affordable housing, again moving affordable housing to areas already being served by the voucher program.

Khadduri (2013) suggests that LIHTC is superior to vouchers when it lends itself to neighborhood revitalization. During the disaster recovery period, LIHTC can improve the quality of housing stock in areas affected by the storm. In addition, new LIHTC

constructed as a result of disaster can mitigate future damages because of improved construction standards (p.2). Khadduri found little research comparing how LIHTC construction performs in high hazard areas, nor were studies found that analyze how often existing LIHTC in coastal communities withstood multiple hurricane hazards. This research opens the door to that analysis by studying the location preferences delineated in QAPs after a major hurricane disaster and location preferences of developers based on stated and revealed preferences.

Revealed Preference Theory

The disaster cycle provides a unique opportunity for effected communities to engage in redevelopment with the intent of creating a modern community along with services and a landscape that enhances the lives and property of its inhabitants. Yet disaster recovery is a difficult process with limited funds available to bring an affected community or region back to normalcy. Housing is but a small segment of the recovery process, albeit one of the most essential, particularly when a large portion of existing housing is damaged. The reality of having limited resources available to assist communities in recovery efforts lends itself well to the theory of preference.

Pioneered by Paul Samuelson, revealed preference theory is a means of analyzing choice by observing behavior. Revealed preference theory arose from theories of choice and utility rooted from the eighteenth and nineteenth centuries pioneered by Georg Cantor and Ragnar Frisch. Revealed preference was proposed by Samuelson as an alternative to ordinal utility theory (Samuelson, 1950) and promoted the idea that any good or service is preferred over an alternative choice. Samuelson (1948) initially

studied individual preferences using an indifference map based on observations. This study analyses the stated and revealed preferences of stakeholders of LIHTC in the context of disaster recovery.

Bockstael and McConnell (2007) studied behavior for valuing environmental amenities using revealed preference techniques. The authors recognized the economic impact inherent in disaster, particularly how impact analysis measured by economic activity does not equate to social welfare.

> "*A major hurricane will increase local expenditures dramatically both in terms of expenditures made to protect property a priori and expenditures made ex post for replacements and repairs. These show up as increase[s] in revenues to construction and materials supply firms. Yet no one would agree that social welfare is enhanced by a hurricane." (p. 3)*

Stated preference identifies preferences with interviews or surveys. This study used a survey to illicit stated preferences from LIHTC developers to understand how disaster recovery policies influence decision-making. Stated preferences of the Florida Housing Finance Corporation (FHFC), representing the public agency, were identified with a content analysis of Qualified Action Plans. The value of stated preferences was demonstrated in a study of the Exxon Valdez oil spill. Carson et al (2003) conducted interviews for a large scale contingent valuation study that identified stated willingness-

to-pay by households to assess the harm associated with the disaster. Stated preferences were also used when attempting to value the damages associated with the Exxon Valdez oil spill. The researchers used direct interviews as opposed to observations of behavior because revealed preferences were difficult to obtain and indecisive (Bockstael and McConnell, 2007).

Others studies have combined stated and revealed preference methods as a means of comparison. Valuing environmental amenities was the subject of a study that compared revealed and stated preference models (Adamowicz et al., 1994). The stated preference model is a direct method for valuing environmental amenities. In this model, a stated choice was acquired from respondents using hypothetical choice sets. Revealed preference, an indirect method of value used to observe choices, was used to compare results. This study used a survey to illicit stated choices from LIHTC professionals and content analysis to determine the states choices of the public agency. Revealed preferences were garnered using geographic information systems (GIS) to isolate demonstrated development patterns for comparison of location preferences in the aftermath of hurricane disaster.

During disaster recovery, choices are made to allocate a limited amount of funding to critical projects, such as infrastructure, housing and economic development. Policies formed before disaster strikes can guide leaders in their funding allocation preferences. Disaster management plans are unable to predict every nuance of housing redevelopment needs or developer risks that inhibit affordable housing development

when expedient housing recovery is needed. This study compares the stated preferences of LIHTC community and FHFC by observing revealed preferences using Geographic Information Services (GIS). The study also ranks risk variables in a modified STEEP model based on responses by survey participants to identify the level of perceived risk and willingness to develop during disaster recovery.

DISASTER THEORY

According to Smith and Wenger (2007), the recovery phase of disaster is little understood among researchers and practitioners. Communities are challenged to rebuild basic services, infrastructure, and the local economy. Individuals are faced with rebuilding homes and lives. Business owners are faced with determining the feasibility of whether to restore or not. Housing providers, within the context of a business model, have to factor in risk and financial constraints to determine if, where, and when rebuilding and restoration will occur. Policy makers focus on reconstructing a sustainable community using limited resources. Decisions are made about who will be winners and losers when available funding is weighed against social, economic, and environmental needs; needs which far outweigh available resources. In addition to basic economic realities, stakeholders and decision-makers are faced with contradictory policies, complex interconnections between participants, and limited understanding of how all of these complexities impact the effectiveness of public and private systems for supplying a sufficient number of affordable housing units.

The community leans toward the restoration of a familiar place while at the same time striving to reconstruct a safer and more equitable society (Kates et al., 2006, p.

14656). New sustainable development potentially replaces old and run-down buildings, depending on political will and the struggle between available resources and competing interests of who benefits from recovery and restoration (p. 14656). This paradox was seen in action after Hurricane Katrina nearly devastated the Lower Ninth Ward in Orleans Parish, Bernard Parish and Jefferson Parish. Over 51% of white-occupied homes and 67% of black occupied homes were damaged or destroyed in these areas. Yet redevelopment was criticized for being inefficient and for straining public services (Simunovich, 2008). Urban redevelopment programs were heavily criticized for failing to house low-income households while building a new community that highlighted the economic revitalization of the area, leaving many lifelong residents behind. Ultimately, disaster planning requires that stakeholders participate in a dialogue that guides redevelopment during recovery. LIHTC developers, as the primary provider of affordable multifamily housing, can contribute expertise to housing recovery policy by identifying the programs most effective for affordable housing production during disaster recovery.

Researchers from many disciplines have studied disaster in the context of their fields, but ultimately there are five bodies of theory in the literature on the disaster recovery process. These are the social, institutional, environmental, economic, and physical theories of study. These areas contribute to disaster theory through the construct of competing choices. What these bodies of knowledge reveal about disaster recovery is that the process is circuitous and complex. Multiple sectors of society have a role in the recovery effort but lack understanding of how each sector affects outcomes (Alesch,

2005). Quick decision-making is undertaken under political and social pressures which inhibits the process of integrating and learning from past experiences. These are the realities that converge in the emerging theory of disaster recovery (Alesch, 2005). It is a goal of this research to contribute to that emerging theory.

THE THEORETICAL DOMAIN OF DISASTER RECOVERY

Much of the literature emphasizes the social outcomes of disaster recovery, particularly for low income and disadvantaged populations. Homeowners and economic redevelopment receive the bulk of disaster aid in the form of grants and low-interest loans. Renters and low-income families face being permanently displaced from the community. During disaster recovery, LIHTC multi-family housing developers are at a disadvantage. LIHTC developers face additional risks that influence decisions to produce affordable housing during recovery. This study was interested in the perceived risks that influence LIHTC development during recovery. The goal of this research is to compare stated preferences and revealed preferences to isolate risks for LIHTC production in Florida. Understanding LIHTC risk informs policy makers of the expert assessment of the programs most likely to facilitate a robust affordable housing recovery.

There are several theories that emerge in the literature that encompass various disciplines in the study of housing and disaster recovery. Much of the research surrounding disaster recovery and low-income housing is grounded in the theories of environmental justice and social justice from the legal and sociological disciplines respectively. The plight of disadvantaged populations fits well within these areas of focus because of the concern for human rights and the social functions of society.

Privatization evolves from economic theory and seeks to implement market mechanisms to improve efficiency in government programs through public/private partnerships, tax credits, and vouchers (Savas, 2000). The public housing model has coalesced into a modified public-private partnership model where private developers are incentivized through tax breaks or subsidies to provide low-income housing to those in need. During disaster, incentives and government aid is expected to expedite recovery so a sense of normalcy and economic activity can return, ideally to a better than pre-disaster condition, even if the poor are excluded. The provision of low-income housing during recovery also has roots in public choice theory attributable to public discourse and political response. Public choice theory was developed by Buchanan and Tullock (1962) in an effort to explain how decisions are made in the political arena. Supply side programs, such as LIHTC, are among existing housing programs driven by government policies. Policies are often modified during disaster recovery to facilitate redevelopment of affordable housing by the private sector (Figure 2-1). An understanding of associated risk variables contributes to an ongoing discourse of housing deficiencies post-disaster.

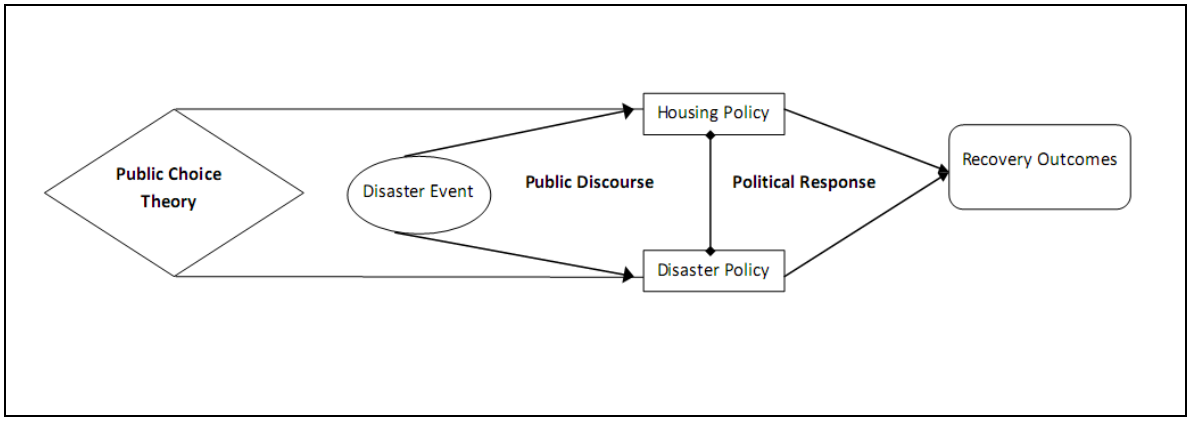

Figure 2-1: Public Choice Theory and Post Disaster Housing Recovery

The perception of risk in hazardous areas may influence the development decision-making process. In economic literature, risk is typically conceptualized as uncertainty over future outcomes (Bodie, Kane and Markus, 1993). Knight (1921) defined risk as measurable as opposed to uncertainty which is "not susceptible to measurement." This study identifies risk and uncertainty, merging the two into what is conceptualized as perceived risk. For the purpose of this study, perceived risk is defined as the stated actions and motivations that stem from social, economic, environmental, and political experiences. Expectations of risk, whether perceived or quantified, should influence decisions about where LIHTC projects will ultimately be developed.

For this study, temporal changes in demonstrated location preferences were expected as the disaster event became a distant memory. Temporal changes were examined in the course of this study to compare revealed preferences with stated preferences. This analysis sought to extract variables of risk from a comparison of stated and revealed preferences. The study also sought to make note of variations in site choices over time.

An embedded revelatory case study approach was used to determine the reasonableness of the variables developed from the literature. A survey of LIHTC professionals ranked each of the variables by order of preferences. In the analysis, variables presented were interpreted in terms of risk. The case study method was chosen as an empirical study of LIHTC production in Florida after hurricanes Charley, Jeanne, Frances and Ivan hit the state over a six-week period in 2004. The study begins with the proposition that affordable housing production is driven by housing need based on population, but in the case of disaster, housing damages often drive public policy.

The Hurricane Housing Working Group (HWG), convened by the Governor Jeb Bush, stated recommendations for housing recovery. Location preferences of the public agency were communicated in the Qualified Action Plans (QAP), published annually by the Florida Housing Finance Corporation (FHFC). Evidence of HWG recommendations were also communicated in the 2005 and 2006 QAPs. Geographic information systems (GIS) technology was embedded in the case study to analyze demonstrated LIHTC development patterns during the analysis period. Using GIS as a method of analysis provided a geographic study of development patterns in conjunction with Sea, Lake, and Overland Surges (SLOSH) models to analyze LIHTC developments located in the boundary of storm surge. There is no evidence in the literature to suggest that a comprehensive storm surge analysis has ever been completed for Florida LIHTC. Figure 2-2 demonstrates the case study framework for this study.

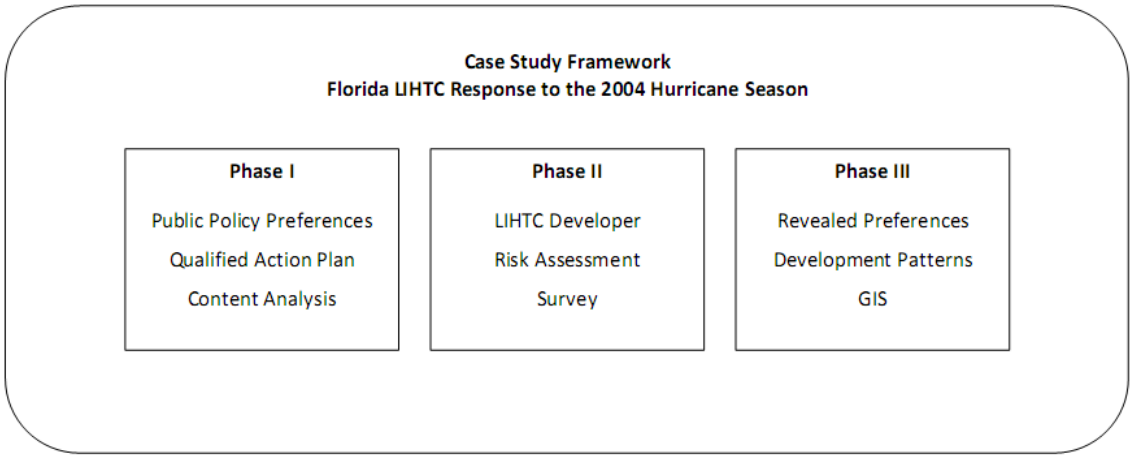

Figure 2-2: Embedded Revelatory Case Study Design

Chapter 3

FLORIDA AND THE LOW INCOME HOUSING TAX CREDIT

INTRODUCTION

A revelatory case study design was used to complete a location and risk analysis of LIHTC in the aftermath of the 2004 hurricane season in Florida. The case study also developed risk variables that were ranked by participants, which was discussed in the previous chapter. This chapter spotlights a brief history of housing assistance and the LIHTC program in general. LIHTC in Florida is further described in relation to the 2004 hurricane season to analyze the suitability of Florida LIHTC and Disaster Recovery as a case study.

HOUSING ASSISTANCE IN THE UNITED STATES

The U.S. Congress has played a role in housing since it funded research to study slums in American cities in 1892. Federal aid was first proposed by President Theodore Roosevelt in 1908 when he established a Housing Commission to study housing for low income households. It was not until 1918 that Congress authorized $100 million to finance projects for the United States Ship Building Corporation for housing workers during World War I. In 1922, then Secretary of Commerce, Herbert Hoover, promoted home ownership with the Own Your Home campaign. Hoover continued to tout the virtues of homeownership through the decade until the Great Depression.

The Great Depression saw a wave of foreclosures as mortgages became unaffordable and families were forced from their homes. Unemployment climbed to

twenty-five percent. Incomes fell by forty percent. In 1932, the Federal Home Loan Bank System was established by Congress in response to the work of the White House Conference on Home Building and Home Ownership, convened by President Herbert Hoover in 1931 to gain a better understanding of the barriers that were holding back homeownership (Hoover, 1931). Hoover signed the Emergency Relief and Construction Act into law on July 21, 1932, which authorized the Reconstruction Finance Corporation to make loans for public service projects, including slum clearance and low-income housing construction. According to the Department of Housing and Urban Development, actions taken in 1932 were the first significant housing activities undertaken by the federal government.

When Roosevelt took office in 1933, he immediately took steps to provide relief for homeowners by establishing the Home Owners Loan Corporation. He continued to fund grants and slum clearance through the Public Works Administration and the Public Works Emergency Housing Corporation. By 1934, nearly half of all residential loans were delinquent and homelessness continued to increase. At the height of the Great Depression, millions were homeless, living with relatives, finding shelter in vacant buildings, or existing in organic shanty towns. The National Housing Act of 1934 was a pivotal piece of housing legislation that set in motion policies that established public housing in the U.S. Initially, the Act created the Federal Housing Administration (FHA) to insure single-family homes as a means to spur home construction for ownership. It was not until 1937 that the United States Public Housing Authority was created under the

National Housing Act to authorize loans and subsidies for public housing (Quigley, 2000).

The Evolution of Housing Policy for the Poor

Housing policies have rarely been about just housing in isolation (Schwartz, 2015; Edson, 2011). When the United States Public Housing Authority was enacted, the declaration stated the purpose of the act was to help States ease unemployment first, and then to improve housing for low income families. In 1940, the Lanham Act allowed federal funds to be used to produce public housing as a part of the war effort to house defense industry workers. This was followed by legislation to exercise rent control under the Emergency Price Control Act of 1942 to curtail rent inflation after the war. Katz et al (2003) analyzed seventy years of housing policies at the state and local level and found only two that directly addressed affordable and decent housing.

It was not until 1949, under President Harry Truman, that the Housing Act authorized the construction of a large number of public housing units. While 810,000 units were authorized to be built by 1955, only 125,000 were actually constructed. Urban renewal and slum clearance projects undertaken under the act actually destroyed more housing than was replaced (Thomas, 1997; Rusk, 1999; Teaford, 2000), a charge that would be repeated during the recovery phase of Hurricane Katrina in 2005 (Campanella, 2006).

The 1950s and 1960s ushered in programs to assist the elderly and disabled in obtaining housing. The Housing Act of 1956 authorized housing agencies to increase spending for elderly housing and expanded eligibility for single elderly households to

obtain public housing. The Housing Act of 1959 authorized Section 202, a program that allowed non-profit organizations to develop housing projects for the elderly. The reauthorization of the Housing Act in 1961 continued support of the elderly by authorizing rental subsidies to this segment of the population in addition to providing government insured loans for low-income housing construction.

President Lyndon Johnson took office in 1963 and ushered in his ideas for the Great Society with the goal of eliminating poverty and racial injustice. During the Johnson administration, Congress established the Department of Housing and Urban Development as a cabinet-level agency and created the Model Cities Program as one component of Johnson's war on poverty. The Model Cities Program was replaced by the Community Development Block Grant (CBDG) program in 1974; CDBG is still a key element of housing policy today. Various mortgage subsidies were also launched from the Kennedy administration in 1961 through the early 1980s when Ronald Reagan took office to encourage the private sector to produce low-income rental housing for the poor, elderly and disabled. Other than Section 515, which subsidizes rural housing development, the grants and programs from this period did not produce additional public housing but relied on existing stock or the private sector. According to the Section 8 contract database that is maintained and publicly available through hud.gov, as of 2012, the Section 8 program provided rent subsidies for 1,034,445 households. These units were constructed over a 20 year period between the early 1960s and the early 1980s and are for profit entities owned by private parties or non-profit organizations (Schwartz, 2015).

By 1969, housing subsidies for tenants became tied to income. Initially set at twenty-five percent of household income, the threshold is currently capped at 30% even though many households are paying considerably more of their income for housing. In 1970, the Experimental Housing Allowance Program demonstrated the feasibility of rent subsidies in privately owned buildings, becoming the precursor to Section 8 multifamily housing.

The Housing and Community Development Act of 1974 consolidated many housing grant programs under the CDBG program and created the Section 8 voucher program to subsidize rent for low income households living in privately owned housing. Vouchers were proposed as early as 1937 but did not become a matter of policy until 1970 with the Experimental Housing Allowance Program. The Housing and Community Development Act of 1974 created the first permanent voucher program and was managed by local housing authorities nationwide (Schwartz, 2015). In 1983, Reagan introduced the Housing and Urban-Rural Recovery Act to provide more flexibility for tenants using vouchers. Like other programs and statutes, the voucher program has been modified and renamed through the years, but it is still the largest demand-side housing subsidy program for low-income households.

The Low Income Housing Tax Credit was established in 1986 and provides roughly $5 billion in annual tax credits to developers in exchange for capping rents at either 50 percent or 60 percent of area median income (AMI). Housing must remain affordable for a minimum of 15 years or investors risk significant financial penalties. Some argue that developers collect rents at the same rate as would be collected if there

were no subsidy at all (Glaeser and Gyourko, 2008). The LITHC program is described in greater detail in a separate section of this chapter. Housing for the homeless was addressed in 1987 with the advent of the Stewart B. McKinney Homeless Assistance Act.

The HOME Investment Partnership (HOME) was created through the 1990 National Affordable Housing Act. HOME is a block grant program that focuses specifically on low- and moderate-income households. The difference between CDBG and HOME is that the latter is limited to housing while the former provides flexibility for a wide range of community development projects. State and local governments can choose how HOME funds are spent as long as projects are spent on housing programs for low-income households (Schwartz, 2015). Funding is divided between state and local government at 40 percent and 60 percent respectively. Congress requires that at least 15 percent of HOME funds be allocated to community based nonprofit organizations known as Community Housing Development Organizations. HOME funds must also be matched with other funding sources, and can be used in conjunction with LIHTC. As of November 2012, the HOME program was instrumental in assisting 1.3 million renters and homeowners with housing (Schwartz, 2015). Roughly half of all HOME funds have been allocated for rental housing. HOME-funded projects often serve a different population from LIHTC because assistance must be targeted to households with incomes at 80 percent or less of AMI for owners or no more than 50 to 65 percent of AMI for renters. Like LIHTC, HOME-funded rental housing must maintain affordability for a minimum of 15 years.

Several programs were initiated in 1993 that contributed to a new round of urban redevelopment, including the creation of empowerment zones by Congress which was intended to encourage development in distressed areas. The Urban Revitalization Demonstration Program, or HOPE VI, was also authorized the same year. The goal of HOPE VI was to demolish and redevelop distressed public housing following recommendations of the National Commission on Severely Distressed Public Housing. The program funded the demolition of distressed public housing units but has been criticized for replacing them with less than 55 percent of equivalent public housing units necessary to support households with very low incomes (Schwartz, 2015; Kingsley, 2009; Popkin et al, 2004). Kingsley (2009) asserts that the percentage of replacement public housing is closer to 81% because as much as a third of public housing units scheduled for demolition through HOPE VI were vacant units. This view is discounts the "prolonged" pre-demolition period in which neglected maintenance and upkeep forced households to move out while management allowed units to remain vacant (Goetz, 2013, p. 91).

As this brief history points out, housing assistance in the United States falls into three categories:

- Tenant-Based: subsidies given to individual households including Section 8 vouchers.
- Public Housing: Housing typically owned and managed by local government, usually a state or local housing authority.
- Project Based: subsidies given to the owner of housing units which must then be rented to lower income households at affordable rates. Privately

owned Section 8 Multifamily Housing and the Low-Income Housing Tax Credit Program both fall into this category.

This study centered on the Low Income Housing Tax Credit (LIHTC) program in the context of disaster recovery. The next section begins with a brief overview of LIHTC, how the program works, and how it is used in Florida to produce affordable housing. The chapter closes with a description of the 2004 hurricane season in the State of Florida with an overview of housing damages around the state.

THE LOW INCOME TAX CREDIT PROGRAM

The Low-Income Housing Tax Credit (LIHTC) program was established under the Tax Reform Act of 1986 in an effort to incentivize private development of low-income rental housing. The program is a supply side housing program administered by the Internal Revenue Service and is the single largest subsidy for low-income rental housing production (Schwartz, 2015, p. 135). The incentive for investors to participate in the program is the tax credit that reduces federal income taxes dollar for dollar. The program has funded more than 2.5 million affordable housing units since its inception and accounted for as much as half of the multi-family rental housing constructed through 2010 (Khadduri, Climarco, and Burnett, 2012).

According to the Department of Housing and Urban Development (HUD), state and local housing authorities are awarded tax credits totaling nearly $8 billion annually. Housing authorities are authorized to issue credits for the acquisition, rehabilitation, or new construction of rental housing for low-income households. HUD maintains a national database on the size, unit mix, location, and contact information for individual

projects. Each year, states are required to adopt a Qualified Action Plan (QAP) that establishes the priorities and scoring methods that will be used to allocate tax credits. Developers compete for tax credits based on the criteria established in the QAP. Financing for LIHTC developments go through the same stages as a typical development: pre-construction loan, construction loans, and permanent financing. The acquisition of financing begins at conception and can be complicated because multiple layers of grants, bonds, tax credits and local programs are often used to reduce the developer's equity requirement and maintain project feasibility. Tax credits are used to reduce an investor's tax liability dollar for dollar over a 10-year period beginning at occupancy. The LIHTC property must remain affordable for an initial 15-year compliance period and an extended 15 year non reporting period with an agreed upon proportion of units to be occupied by low-income tenants under the 20/50 or 40/60 rule. Proper management is critical to maintaining compliance throughout the 15 year period because severe penalties are applied to investors should the property fail to meet affordability requirements. Good management is also essential to maintain profitability amid tight profit margins. LIHTC has been noted for being complicated because of the layered financing structures needed for feasibility and compliance (O'Regan and Quigley, 2013; Schwartz, 2010). The following sections discuss each aspect of the LIHTC program in more detail.

Understanding the Qualified Action Plan

The Qualified Action Plan (QAP) is mandated by the federal government and is created by state and local housing authorities on an annual basis to explain how tax credits will be allocated. The QAP sets the criteria for competition for 9% tax credits,

which are fixed annual quotas received by state and local housing authorities. Nine percent tax credits are allocated for new construction. Four percent tax credits are used for rehabilitation and new construction completed with tax exempt bonds. This study does not differentiate between 9% or 4% credits, but analyzes disaster recovery preferences of the LIHTC program overall.

Federal criteria and standards that are required to be included in the QAP are project location, characteristics of housing needs, sponsor characteristics, and tenant populations (i.e. the elderly, disabled, and families with children). Additional allocation requirements can be established at the state and local level depending on need and often include additional requirements for housing the lowest income households, projects that commit to longer term affordability, location in qualified census tracts (QCT) or difficult to develop areas (DDA), and participation of local non-profit organizations. After disaster recovery, state and local housing authorities may set preferences for impacted areas. Developers and stakeholders have the opportunity to comment on proposed requirements during the QAP development phase for the following year's allocation.

Each state has a unique approach to the QAP. Provisions are often rated using point systems, thresholds, and set-asides, although some states use alternative language to communicate preferences. QAPs in Florida do not reference a point system, but instead uses language such as "targeted" to express preferences within the QAP. Florida universal applications use points in a limited basis as a tie-breaker in general areas of development design or for certain physical features not specified or required within the

QAP. Analysis of universal applications was not a part of this study but could contribute additional context to public preferences established by the state housing authority.

Basis boosts and policy statements can be just as influential in project selection (Shelburne 2008; Gustafson and Walker 2002). Some states award tax credits based strictly on point scores while others maintain some flexibility and award credits by more subjective means. Thresholds establish minimum standards and result in some projects being excluded entirely from the process. Set-asides are pools of tax credits that are designated for specific targets or categories, such as a particular area, or with specific features, that are competed for among all properties that qualify for the set-aside. The development community that wishes to compete for tax credits must be willing to invest in a property within the bracketed characteristics established in the QAP. Rather than a strict point system, Florida's use of targeted language and limited use of points in the universal application indicates some flexibility for choosing which projects are awarded credits.

The Ownership Structure of LIHTC

Ownership in LIHTC includes multiple parties that have a stake in the success of the project (See Figure 3-2). Developers, local government, investors, partnerships, stakeholders, and property management play important roles in developing and maintaining compliance and feasibility of the project through the compliance period, which is at minimum 15 years, plus an extended 15 years based on the criteria established by the state and local housing authorities.

Developers generally specialize in affordable housing, but often participate in other types of development. In either case, the development of a LITHC property follows the same rules as any other real estate project, minimization of risks and maximization of profits. The developer is compensated with entrepreneurial profits at each stage of the development process and is shielded from liability through a limited partnership corporate structure according to state laws.

The owner operates as a separate entity from the developer for tax purposes. Ownership often consists of corporate owners and partnerships that are brought together under a limited partnership. A general partner interest holds 0.01 percent while the limited partner holds the remaining 99.99 percent interest. Limited partners do not participate in direct management.

Tax credit investors are often corporate entities or investment groups that participate in LIHTC to offset other income. Investments are priced as a function of demand which is fueled by the need to offset taxes. This became a problem between 2007 and 2009 because of fallout from the Great Recession of 2008 (Schwarts, p. 157, 2014). Corporations no longer needed to purchase tax credits because income was virtually non-existent as the country reeled from the financial collapse (Edson, 2011). To mitigate the effects felt by LIHTC, Congress adopted the Tax Credit Assistance Program (TCAP) through the American Recovery and Reinvestment Act of 2009. The LIHTC database reports funding categories that are used in conjunction with LIHTC for each development. At the time of this study, TCAP was not included. At the same time that TCAP was adopted, Congress created a credit exchange program which allowed

administering agencies in the state to exchange tax credits for cash grants to developers. Properties developed with tax credits issued through TCAP were required to be placed in service by 2012. TCAP was in place between October 1, 2006 and September 30, 2009 and was used to fund LIHTC in conjunction with programs developed for disaster areas, including the Gulf Opportunity Zone and Midwestern Disaster Area Housing Credits. These programs are not reported in the LIHTC database.

Tax credits cannot be used for land acquisition, and as is generally recognized, location is instrumental to a successful real estate development. Often the developer will either purchase land for development or will develop land from their portfolio. In either case local government must agree to, and sign off in writing on, any LIHTC development before tax credits can be awarded. State and local governments may have funds for land acquisition in the form of block grants, loans, or trust funds that developers can apply for. Local government has jurisdiction over land use and the regulatory requirements for development, such as zoning restrictions. Additional support can be given for the project with variances for land use, property tax deferrals or abatements, or waivers of permitting fees. In return the local government may require that additional conditions be met in the form of amenities, population served, or any other conditions that are needed to solve problems in the community.

An allocating agency exists in each state and for certain larger municipalities within the state. The allocating agency is usually the state housing authority and local housing authorities who receive tax credits annually per capita from the U.S. Treasury.

The housing authorities in turn issue the tax credits to developers on a competitive basis under the conditions outlined in the annual QAP.

Community partners and stakeholders can make or break a project. The most obvious community partner is the housing authority itself, which has set priorities for housing needs in the state. Neighborhood associations and landowners around a proposed site can express support or deny support based on any number of factors including impact to surrounding properties, or more notably, the Not in My Back Yard (NIMBY) phenomena. This study does not expressly examine NIMBY and LIHTC directly, but the survey of LIHTC professionals suggested that those who oppose LIHTC based on the principle of NIMBYism are unaware of the favorable tenant mix of low and median income households and the physical appeal of newly constructed LIHTC properties. Community Development Corporations (CDC) are local nonprofit community-based organizations that typically focus on revitalization of low-income neighborhoods. CDCs play a critical role as a LIHTC stakeholder because their support can lend credibility to a proposed project among other stakeholders and local agencies.

Project lenders are involved in the LIHTC development from pre-construction through the permanent loan. Each phase may involve the same lender or not. Land acquisition requires predevelopment funding and often involves a bridge loan. A construction loan provides the funding when the project construction begins and is dispersed at agreed upon phases during construction. The construction loan will take out the land acquisition loan. Finally, when the project is complete, a permanent loan is put into place, which will be used to take out the construction loan.

The Syndicator

A syndicator brings the LIHTC finance package together and pools funds from multiple investors. The syndicator usually arranges the limited partnership where multiple investors pool resources and share in a proportional share of the net income from LIHTC operations. Management is left to the general partner. In effect, the syndicator is the intermediary between the developer and the investors. Some syndicators provide a turnkey package that includes lender financing from land acquisition to the permanent loan.

The investment instrument works in much the same way as an investment fund where the investors have little knowledge or interest in the details of day-to-day operations, but as in the case of LIHTC, are more interested in the tax benefits. The syndicator works closely with the development team and management company to insure the project remains compliant for the 15 year minimum period so investors are not penalized. The penalty for noncompliance is severe. If a LIHTC does not maintain the number of agreed upon affordable units, the investor faces potential recapture of all the tax credits awarded retroactively.

Maintaining Affordability

As stated previously, LIHTC allows investors to reduce their federal incomes taxes each year for ten years, dollar for dollar, as long as the development stays in compliance. Two types of LIHTC are available for investors, the 4% credit and the 9% credit. A 4% credit is typically taken for rehabilitation or new construction supplemented with tax-exempt bonds. The credit is taken in annual installments over a ten-year period

(Table 3-1). A 4% credit is intended to deliver 30% of the qualified basis for a LIHTC project. The 9% credit works the same way only it is intended to deliver 70% of the qualified basis for the project. Projects that do not use any other federal subsidies are supported with the 9% tax credit. Both the 4% and 9% credits fluctuate because they are tied to market interest rates. According to the US Department of Revenue, the 9% rate has historically ranged from as low as 7.35% to 9.27%. The 4% rate has fluctuated from 3.15% to 3.97%.

Table 3-1: Calculating the Annual LIHTC Credit for Investors

Anatomy of the 4% and 9% Tax Credit			
ABC Apartments **100 units - all intended for low-income families** **Eligible for 60% of area median rents** **Rents are set at 30% of the median**		**CBA Apartments** **100 units - all intended for low-income families** **Eligible for 60% of area median rents** **Rents are set at 30% of the median**	
Project Cost:	$15,000,000	Project Cost:	$15,000,000
Land	$ 3,000,000	Land	$ 3,000,000
Subsidies	$ -	Subsidies (Tax-exempt financing)	$ 900,000
Eligible Basis	$12,000,000	Eligible Basis	$11,100,000
Qualfied Basis	*100%*	*Qualfied Basis*	*100%*
Total Basis	$12,000,000	Total Basis	$11,100,000
Tax Credit	**9%**	**Tax Credit**	**4%**
Annual Credit	$1,080,000	Annual Credit	$444,000
Credit to Investors over 10 Years	$10,800,000	Credit to Investors over 10 Years	$4,440,000

Source: Modified from Schwartz, 2015

A development remains in compliance as long as a specific number of units remain affordable for low-income households for a period of 15 years plus an additional 15 year period. Compliance is closely monitored during the initial period. Tax credits are assigned to specific housing developments and are attached to the units instead of tenant household income. Developments are eligible for tax credits if at least 20% of

units are affordable to households earning up to 50% of area median income (AMI) or if 40% of units are affordable to households earning up to 60% of AMI. For instance, if a development is 100% occupied, and a low-income household vacates a unit, then that unit must be rented to another low-income household. Most developers opt to designate most of their units for low-income occupancy to maximize the amount of credit they receive, having the effect of reducing their equity investment and making the project more feasible. According to Schwartz (2015), more than 70% of all developments constructed with LIHTC designate 100% of units for low-income households. In addition, evidence suggests that most developments target families with lower incomes. A study of 12,228 LIHTC developments around the country found that over half of the total units had tenants with incomes at or below 40% of AMI. This seems to correlate with earlier studies that found average annual incomes of LIHTC tenants to be between 45% and 50% of AMI (Schwartz referencing E&Y Kenneth Leventhal Real Estate Group, 1997:7; GAO, 1997, p. 38; and Cummings and DiPasquale, 1999).

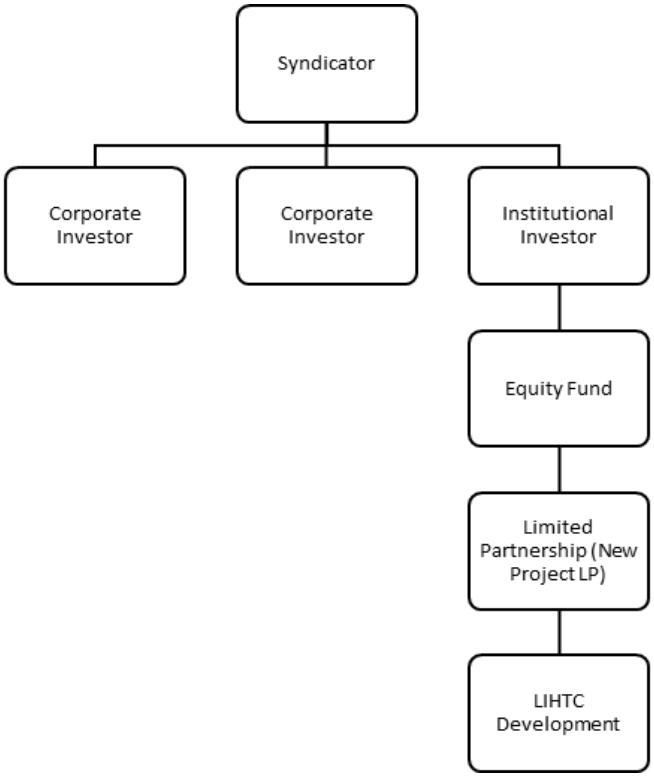

Figure 3-1: Investment Structure of LIHTC Development

Administration of LIHTC in Florida

Florida has 67 counties that accept and administer funds for housing needs throughout the state. Several agencies, including 115 public housing agencies and 17 regional housing finance authorities manage smaller housing programs throughout the state. However the bulk of housing resources are managed by the Florida Housing Finance Corporation (FHFC), including the LIHTC program. FHFC works with local governments, non-profits, elected officials and others to complete its mission of providing affordable housing throughout the state. Programs that support multifamily housing in the state include Multifamily Mortgage Revenue Bonds, Florida Affordable Guarantee Program, HOME Investment Partnerships, Elderly Housing Community Loan, and the Low Income Housing Program (LIHTC). Florida also has special programs that support the predevelopment phase of affordable housing development. The Predevelopment Loan Program (PLP) is limited to eligible non-profits or community based organizations, public housing authorities, and local governments and can be used to support a wide range of predevelopment expenses from title searches to feasibility studies.

Florida LIHTC can be used in conjunction with the HOME Investment Partnerships program, PLP, the State Apartment Incentive Loan program, or the Multifamily Mortgage Revenue Bonds program. A percentage of units must be set aside for low-income or very low income households for a minimum of 30 years with an option to revert to market rates in the 14th year. Otherwise, Florida requirements are consistent with 20/50 and 40/60 LIHTC. As required by law, housing needs are assessed annually.

FHFC conducts market studies and solicits input from the public to determine housing needs throughout the state. Funds are targeted by county according to need and can be reserved based on geographic area or demographics. The demographic needs identified from QAPs in this study include commercial fishing workers, farmers, and the elderly. Geographic locations included the Florida Keys, urban infill, Front Porch Communities, rural areas, and counties impacted by the 2004 hurricane season. According to FHFC, the tax credit program has allocated over $201 million in credits for more than 53,000 units since its inception.

THE FLORIDA 2004 HURRICANE SEASON

The majority of tropical storms occur in the mid-Atlantic, Caribbean, and Gulf of Mexico from mid-August through October (Landsea et al., 1999). Between 2003 and 2005, the peak of the hurricane season for Florida arrived in September (Virmani and Weisberg, 2006). In 2004, Florida experienced an onslaught of hurricane activity in a short six week period. The first hurricane hit Port Charlotte on August 13 as a Category 4. Hurricane Charley had sustained winds of 150 miles per hour. In spite of wind speeds, Charley was a small hurricane with storm surges limited to within 6 to 7 miles from the center (Pasch, Brown, and Blake, 2011). Storm surges were relatively small, not exceeding 7 feet. Charley caused damages estimated at $15 billion, making it the second costliest hurricane in U.S. history.

Hurricane Frances was the next hurricane to hit the Florida coast that year. On September 4th, Frances hit both Palm Beach and Martin counties as a Category 2 storm with winds of 105 miles per hour. Rains were so heavy that a portion of Interstate 95

collapsed. The state citrus crop was destroyed and major flooding occurred in counties directly hit by the storm. Storm surge was 6 feet along the east coast where Frances hit. Space facilities at Cape Canaveral reported damages in excess of $100 billion. The American Insurances Service Group estimated that $4.11 billion in damages occurred statewide. Total damages for Hurricane Frances were estimated at $9.507 billion, 90% of which occurred in Florida. As of 2011, Frances was the eighth costliest hurricane in the U.S. (Beven, 2014, p. 4).

The next hurricane to strike the Florida coast hit the panhandle on September 16 as a Category 3 hurricane. Winds reach 120 miles per hour and the storm surge ranged from 10 to 15 feet, inundating towns along the coast. Grand Cayman Island was completely washed over by storm surge, damaging or destroying 95 percent of all buildings on the island. As with Frances just twelve days earlier, Hurricane Ivan caused part of Interstate 10 to collapse under the weight of storm surge and wave action. Thousands of homes were destroyed in Baldwin, Escambia, and Santa Rosa counties. Ivan was the most destructive hurricane to hit Florida in over 100 years. Damages were estimated at $18.82 billion and earned Hurricane Ivan 3rd place on the list of costliest U.S. hurricanes (Stewart, 2011, p. 6).

Hurricane Jeanne made landfall just ten days after Ivan, following nearly the identical path as Hurricane Frances just twenty-two days earlier. On September 26, Frances crossed Palm Beach and Martin counties, which were still reeling from the damages caused by Ivan. Frances was a stronger Category 3 storm with maximum winds

of 120 miles per hour. Storm surges were measured from 3.5 feet to 6 feet along the east coast. As of 2011, damages were estimated at $7.66 billion (Lawrence and Cobb, 2014).

According to the Hurricane Housing Work Group (HWG) convened by Governor Jeb Bush, all 67 Florida counties were affected by the four hurricanes in some way, some of them more than once. More than 700,000 homes were damaged or destroyed with losses expected to exceed $213 billion (HWG, 2005). This estimate does not include those who were working exclusively with insurance companies or did not apply for assistance for other reasons. In the aftermath of the storm, 1.2 million households registered with Federal Emergency Management Agency (FEMA). More than 148,800 households applied for rental assistance and 116,000 households received structural housing assistance for repairs. Disaster loans were made available through the Small Business Administration (SBA) for rebuilding homes and businesses. Special assistance was made available to the five counties hardest hit by Charley and Ivan: Charlotte, De Soto, Hardee, Escambia, and Santa Rosa.

The HWG was unable to assess accurate rental damages. Owners of rental properties were referred to the SBA for assistance making it likely that rental damages were underestimated (HWG, 2005). Over 28% of households were renters in the hardest hit areas, but only 15% registered with FEMA for housing assistance (p. 9). What is known is that 100,000 renter households were approved for FEMA assistance in the months after the storms, but according to HWG, this number does not correlate with the rental stock that sustained substantial damage. Multifamily damages were categorized into three groups (see Table 3-2). The most severely damaged properties had structural

Table 3-2: Categories for FEMA Housing Assistance

FEMA Housing Assistance by Group				
Category	**Type**	**Percentage Affected**	**Description**	**Multi-family Units**
1	Structural	16.5	Most Severe; this group had inadequate insurance and did not qualify for SBA disaster recovery loans.	3,247
2	Non-Structural	20.7	The households did not receive structural housing assistance but did receive rental assistance. The marjority of this group (68.8%) were renters.	38,882
3	Ineligible	62.8	This group was found to have adequate insurance to repair their homes; however, FEMA did not determine ability to pay or finance deductibles.	10,787

Source: Hurricane Housing Working Group, 2005

damage and encompassed 16.5% of households seeking assistance. Households that had structural damages but did not get assistance received short-term rental assistance. Other households had adequate insurance and received no assistance from FEMA. Households occupying 52,916 multi-family housing units registered with FEMA for housing assistance representing 2.6% of damaged housing in Florida.

Effects from the hurricanes were felt around the state, but the greatest damages occurred in the impact areas. Table 3-3 shows the multifamily housing stock damaged in each county. Damaged units are compared to existing supply. For instance, De Soto County had 350 multifamily units damaged in 2004, representing nearly 30% of its multifamily housing. Considering the average household size is 2.61 in the State, De Soto had over 900 in need of some form of rental assistance. Palm Beach County had

11,715 multifamily units damaged representing just 5.9% of the total population representing over 30,500 potentially entering the rental market simultaneously. The known total damages of multifamily units provided a basis for comparing developer location preferences revealed in the GIS analysis completed in Phase III of this study. Housing damages in counties that were preference for location in the QAPs following the 2004 hurricane season are shown in Figure 3-2. In some instances, a number was not provided. If fewer than ten households experienced damage, then a number was not disclosed.

After the hurricanes, pledges for recovery and assistance came from federal, state and local organizations, including providers of utilities, power companies, in-state and out of state law enforcement. However, housing assistance during the recovery and response effort primarily benefited homeowners (HWG, 2005). Rent vouchers were distributed as needed for emergency housing, and a Disaster Housing Resources website was launched by the State Emergency Response Team (SERT) to help victims find temporary rental housing. As many as 15,000 travel trailers and manufactured homes were set up; FEMA provided rental assistance to 148,803 households; and Structural Housing Assistance was provided to 116,000 households. These numbers indicate that more than 250,000 households flooded the rental market. This equates to potentially 1,000,000 Floridians seeking shelter in the rental market.

Table 3-3: Comparison of Total Units to Estimated Damages by Housing Type from 2004 Hurricane Season

County	Total		Single Family		Multi-Family		Manufactured Housing	
	# of Units Damaged	% of Total Units County	# of Units Damaged	% of Total Units	# of Units Damaged	% of Total Units	# of Units Damaged	% of Total Units County
Monroe	25	0.1%	19	0.1%	*	0.0%	*	0.0%
Collier	334	0.3%	254	0.4%	20	0.0%	59	0.7%
Glades	505	11.6%	204	10.8%	*	1.6%	297	13.1%
Hendry	1,317	11.3%	632	11.1%	34	3.6%	650	13.0%
Hardee	5,570	64.1%	3,741	61.7%	193	36.5%	1,626	77.4%
Broward	6,932	1.0%	5,251	1.4%	985	0.3%	408	1.9%
De Soto	7,506	64.3%	4,314	65.1%	350	29.1%	2,829	72.8%
Okeechobee	7,668	53.4%	3,946	57.2%	136	17.5%	3,570	53.5%
Miami-Dade	9,481	1.1%	6,289	1.4%	2,458	0.7%	488	3.6%
Martin	19,343	32.1%	14,018	37.3%	1,510	9.4%	3,519	56.6%
Lee	20,761	9.4%	16,577	12.5%	1,179	1.9%	2,951	10.8%
Santo Rosa	23,196	46.9%	18,518	50.5%	879	19.9%	3,409	40.6%
Indian River	29,460	53.5%	22,804	62.5%	2,749	21.5%	3,660	63.1%
Charlotte	34,077	48.0%	27,918	53.0%	2,384	23.6%	3,673	44.8%
Polk	49,809	23.4%	34,346	26.9%	2,850	9.1%	12,465	23.4%
St. Lucie	51,627	60.4%	39,930	64.8%	4,666	30.6%	6,647	76.9%
Escambia	51,876	2.7%	41,922	48.2%	4,024	17.2%	5,077	45.5%
Brevard	56,698	26.0%	43,127	28.6%	3,921	8.4%	8,492	40.9%
Palm Beach	84,001	16.3%	60,351	20.1%	11,715	5.9%	7,794	45.3%

Source: Hurricane Housing Work Group, 2005

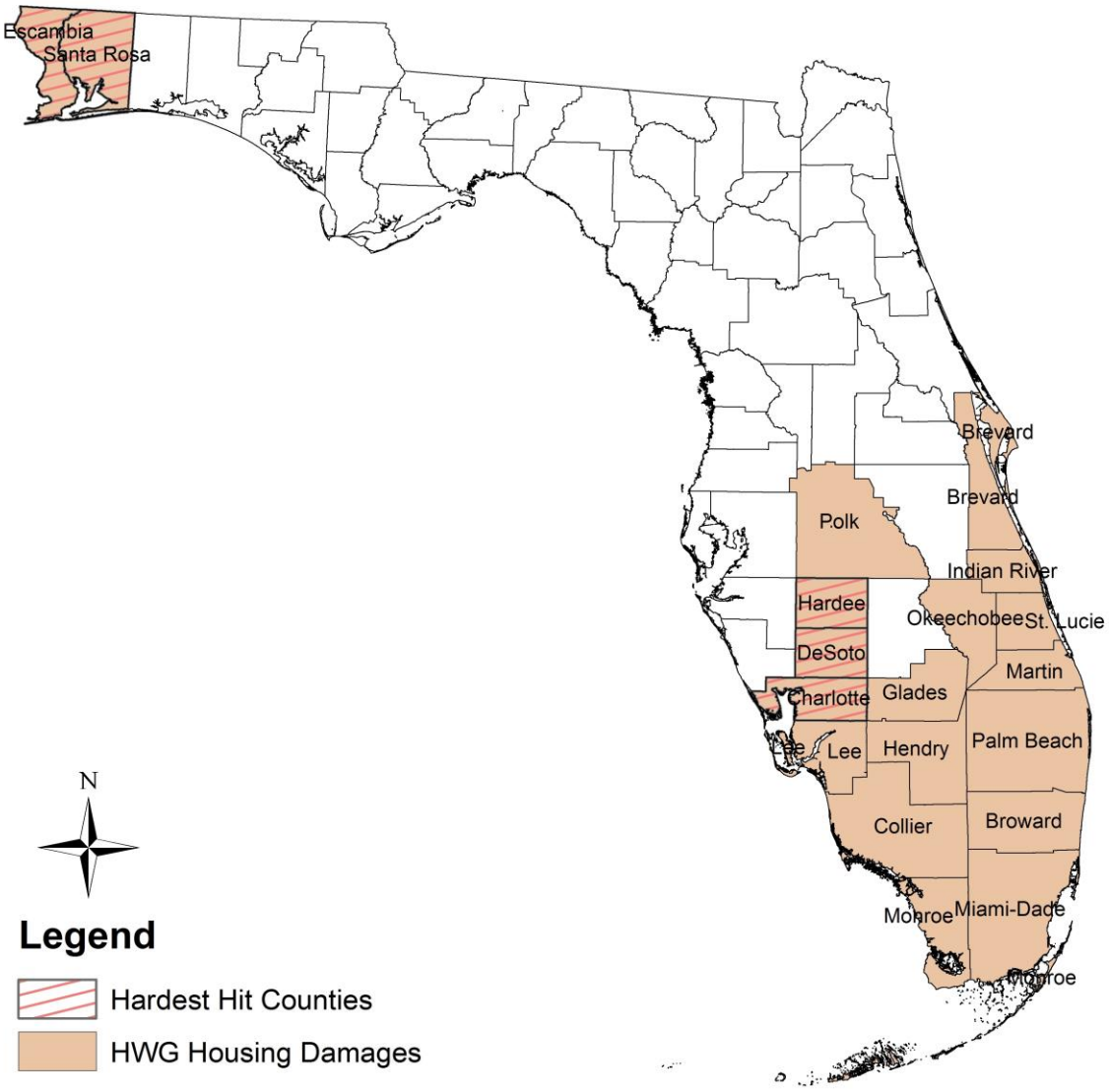

Figure 3-2: HWG Report for Estimated Housing Damages (HWG, 2005)

SBA provides disaster loans to businesses for rebuilding, or for replacing multifamily homes. LIHTC rents are capped to area median income. Additional loan obligations cannot be supported over the long term when income is capped. Even so, HWG noted that additional rental stock would be needed to replace destroyed rental and homeowner housing. The most cost effective way to meet the expected demand was with development of multifamily housing (HWG, 2005). The group recommended that a Hurricane Housing Recovery Program be implemented. HWG also recommended that subordinate financing be provided by the state to induce private developers to build rental housing units in areas of greatest need. It was recommended that rental housing target extremely low income groups in addition to "low income households more commonly served by existing programs" (p. 17).

Resources are rarely, if ever, enough to meet disaster recovery needs. HWG developed a formula for allocating available funds. The formula ranked counties based on four factors: 1) total percentage of damaged non-seasonal housing units in a county, 2) total destroyed units in a county, 3) percentage of households sustaining damage earning less than $30,000 per year, 4) and number of households displaced and requiring FEMA temporary housing. Each county was categorized and ranked into one of four tier categories (see Table 3-4). Future research might include comparisons between the recommendations of HWG and the LIHTC placed in service to glean further insight. This study compares stated and revealed preferences between the Florida Housing Finance Corporation and the LIHTC developer in terms of risk.

Table 3-4: Tiers for Allocation Preferences Established by the HWG (2005)

Tiers	
I	Counties with the most sever housing damages in number and percentages. Counties in this tier were most likely in the impact area or were hit by multiple storms. 16% of counties are in this group.
II	These counties had heavy damages with either a large number of damaged units and/or a high percentage of damaged units, 9% of counties are in this group.
III	Counties in this category had moderate damages either a high number of units damaged or a high percentage of damaged units, 16% of counties are in this group.
IV	Minor damages occurred in these counties and are expected to address housing recovery through existing programs; the majority of counties, 58%, fall in this group.

Source: HWG, 2005

The counties targeted for location in the 2005 and 2006 QAPs were scattered among each of the tiers with 58% of them were in the Tier IV category. Counties in Tiers II and III were less preferred by the public agency. These counties represented 25% of counties in these tiers that were given preference in the 2006 QAP. Tiers II, III and IV were given no preference in 2005 QAPs. Tier I counties were 16% of the total counties preferred (See Table 3-5).

Table 3-5: Household Damages Tiers I-IV

Tiers	# of Counties	% of Total	# Damaged Units
I	11	16%	336,830
II	6	9%	249,694
III	11	16%	58,090
IV	39	58%	63,747
Total	67	100%	708,361

Source: HWG, 2005

CONCLUSION

From the health benefits of slum clearance to the economic benefits of urban renewal, housing policy is often a solution for a related underlying problem. Housing was once undertaken to support manufacturing, evidenced by small mill towns that that housed workers for the benefit of the mill owner. Real estate has been a driver of the American economy, and home ownership has been engrained in the American dream. For owners and renters alike, the greatest concern for housing today is affordability. During disaster recovery, affordability is amplified, particularly when housing damages are significant. This study provides a stepping stone to understand how LIHTC

preferences are established and how developers answer the market demand for affordable housing under the LIHTC program during disaster. Those who produce and fund affordable housing weigh the public demand for affordable housing against risk and uncertainty associated with disaster. This research starts a dialogue comparing stated preferences of each leg of the public and private partnership that is LIHTC to ask how programs and incentives encourage LIHTC construction in hazardous places. The study also compares revealed preferences to understand how LIHTC development patterns compare with the stated preferences of public and private stakeholders. Several tools were applied within an embedded revelatory case study design to compare stated preferences with revealed preferences to determine how risk influences LIHTC production. The next chapter explains the methodology and research design and explains how research tools were used.

Chapter 4

LIHTC RISK AND DISASTER RECOVERY: A CASE STUDY APPOACH

INTRODUCTION

This study used an embedded revelatory single case study design. According to Yin (2009), an embedded single case study design is often initiated with theory development and a proposition, which was demonstrated in previous chapters. This case study design is bounded by LIHTC developers operating within Florida after it was hit with four hurricanes in 2004. Each hurricane elicited a Presidentially-declared disaster area response. Florida is a coastal state surrounded on three sides by the Gulf and Atlantic coast. The state experienced significant losses of affordable housing as a result of the 2004 hurricane disasters. The goal of this case study was to identify risk variables that influence LIHTC developers' decision-making within the constraints of public policy preferences stated in Qualified Action Plans filed between 2004 and 2010. Location analysis revealed preferences for sites of LIHTC multi-family developments post-disaster.

WHY LIHTC AND DISASTER RECOVERY?

Risk drives investment and disinvestment in real estate development decision making. The LIHTC development literature identifies additional risks associated with the program, and much of the LITHC and disaster literature addresses how disaster policies can provide temporary relief for rental demand. This study opens a dialogue toward

better policy that recognizes the limitations of LIHTC production during disaster recovery. This research will serve three purposes:

1) To develop an understanding of risk in development patterns demonstrated by preferences of LIHTC developers in disaster recovery decisions;
2) To inform public and private stakeholders of barriers to LIHTC production so that effective policies and programs can be developed to distribute limited resources while encouraging development of affordable housing.
3) To contribute to the emerging development of Disaster Recovery Theory by informing the disaster community of the risks that influence LIHTC development decisions during the recovery period.

METHODOLOGY

This study was formulated within the paradigm of social constructivism which seeks *"understanding of the world in which (we) live and work"* (Creswell, 2007, p. 21). One of the goals of this study was to share the views of LIHTC housing developers that operate in an area that is susceptible to hurricane disasters. Florida was chosen for this research because of its geographic location and susceptibility to the effects of hurricanes. Future studies will compare other states with similar hazards for common variables based on disaster type, severity, types of programs and policy preferences influencing recovery.

Disaster recovery policies that reshape the community are often driven by economic development. The literature is replete with evidence that demonstrate how renters suffer displacement to a higher degree than homeowners. Developers of multifamily housing experience a similar degree of disparity during recovery.

Multifamily developers are less likely to have access to disaster recovery assistance as compared to homeowners and other community business interests (Comerio et al., 1994; Quarentelli, 1999; Wu and Lindell, 2003; Mueller et al., 2011). Small business loans and additional leveraging tools are often not feasible considering the income generated from an existing project, making recovery efforts more difficult for the developer (Wu and Lindell, 2003; Galster et al., 2004; GAO, 2010). The degree of perceived risk is related to the tools and leverage options available to LIHTC developers. Development challenges exist as a result of disaster recovery policies that inhibit the ability of LIHTC developers to add unexpected disaster recovery costs to already tight budgets. A LIHTC developer's ability to produce sufficient new affordable rental housing stock to the community during recovery is also difficult due to a lack of funding options that support capped rents and recoverable expenses. Other areas of risk that affect LIHTC decision-making are found in the dynamic forces of community in the form of advocacy and NIMBYism. These are anecdotal experiences from which risk variables were established. Additional risk variables were derived from the development literature discussed in Chapter 2.

The study was organized in three phases intended to identify how post-disaster location policy preferences influence development during recovery. This case study uses content analysis, geographic information systems (GIS), and a survey of LIHTC developers within the bounded case study area of Florida after the 2004 hurricane season.

Phase I examined Qualified Action Plans (QAP) using content analysis to determine location preferences of the Housing Authority of the State of Florida as

established within the QAP. This phase uncovers the stated preferences of the public agency. For this study, the public agency was represented by the Florida Housing Finance Corporation (FHFC).

In Phase II, a survey was launched to ask LIHTC professionals to identify the significance of a set of variables associated with perceived risk during the recovery process. The survey was composed of closed-ended questions using a combination of a 10-point sliding scale or a 7-point Likert scale. An open-ended question provided LIHTC professionals an opportunity to share opinions about the state of affordable housing production and actions that could improve existing programs to reduce risk.

Phase III analyzed location preferences using GIS technology with a data layer created from the LIHTC database maintained and publicly available through the U.S Department of Housing and Urban Development (HUD). Additional data layers were created using a storm surge model created by the Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model software. The SLOSH model was created by the National Weather Service (NWS) and the National Oceanic and Atmospheric Administration (NOAA) to estimated storm surge heights. A composite approach was taken using the Maximum Envelopes of Water (MEOWs) because this approach is recommended by the National Hurricane Center as the best way to account for vulnerability and uncertainty for an area. MEOWs and Maximum of MEOWs (MOMs) form the basis for evacuation planning and are integral to the field of emergency management. The SLOSH model is subdivided into 32 regions that are applied to coastlines along the U.S. Atlantic, Gulf of Mexico, Hawaii, Puerto Rico, and the Bahamas.

This case study focused on LIHTC development in Florida. Eleven Florida water basins were applied to SLOSH models for potential storm surges experienced during a Category 3 storm at mean tide (C3M) and a Category 5 storm at high tide (C5H). Shapefiles were created from SLOSH model runs for each category. The LIHTC database was added as a .dbf file. A Florida base map was obtained from TIGER/Files. Data layers of hurricane paths for Charley, Ivan, Jeanne, and Frances were created and LIHTC location was analyzed for developments placed in service from 2004 to 2010. Risk was indicated by proximity to the coast and proximity to storm surge boundaries. Phase III analyzed the number of housing units susceptible to storm surge during C3M and C5H hurricane scenarios. Development patterns were analyzed over the seven year period between 2004 and 2010 to determine if stated risk influenced development outcomes.

Results from the three phases of the study were compared to gain insight to perceived risk of LIHTC developers and revealed development patterns. The research exposed strengths and weaknesses in the interrelationships between location preferences of public policy, developer risk perceptions, and demonstrated development patterns of LIHTC.

A CASE STUDY APPROACH

The depth of inquiry in a case study can capture the essence of a phenomena and its associated context (Yin, 2009). Comparing relationships between policy, perceived risks, and actual patterns of development in the state of Florida after a hurricane disaster is an initial step toward understanding the effectiveness of disaster policy and recovery

programs. According to Creswell (2007), case studies are *"an exploration of a 'bounded system' of a case or multiple cases over time through detailed, in depth data collection involving multiple sources of information rich in context."* In this study, a single case was chosen to establish a baseline of comparison for future research of LIHTC susceptible to hurricane disaster in other coastal states. Secondary data sources used in the study were acquired from HUD's LIHTC database and SLOSH models. Original data was also collected from a survey of LIHTC developers. Previous chapters described the historical context of the effect of the four storms on housing and the policy response. Stake (2000) defined a case study as an *"interest in individual cases, not by the methods of inquiry used."* The methods used in this case study are specific to the state of Florida. Future case studies that emulate this research using the same tools will be reliant on the distinct policies and preferences of the state that interact with existing federal programs and the uniqueness of the disaster event. This is the first study in a series that could lead to an opportunity for comparative analysis of responses to programs initiated for disaster recovery and housing redevelopment in multiple states.

Case Study Proposition

The case study proposition "directs attention to something that should be examined within the scope of the study" (Yin, 2009, p. 28). A search of the literature failed to reveal existing studies of risk specifically associated with LIHTC developers and disaster.

The proposition of this study recognized that affordable housing developers prioritize investment returns as a component of their investment decision making,

however LIHTC developers consider additional risk factors that are not being fully addressed by available housing and disaster programs intended to facilitate recovery. LIHTC housing developers that fail to fully participate in the post-disaster housing market, particularly in the impact zone, theoretically are responding to an array of perceived risks.

Variables of risk were identified in the literature and validated in an earlier pilot study. Each variable was categorized into a modified STEEP analysis for LIHTC development in the context of disaster recovery. The five categories comprising the STEEP analysis are *social, technical, economic, environmental, and political.* Technical and economic risks are measurable in a business analysis. Technical risks are the measurable factors that define project feasibility and success, such as the internal rate of return (IRR), profit or loss. Economic risks are associated with external funding opportunities that potentially improve feasibility. However, perceived risks are subjective and are not readily measured in the context of project feasibility. For this study, those subjective risks are categorized under social, environmental and technical categories. It is well understood that financial incentives drive development behavior. When the funding and costs are in balance, the community benefits from additional affordable housing, in spite of potential disaster risk. The financial community benefits from LIHTC because the typical working class tenant can participate in the established economy. The developer benefits because the affordable housing project gets funded.

In this study, elements of risk perception derived from the development literature provided the basis for the proposition. Risk was measured by comparing stated

preferences of the public agency and LIHTC professionals stated and revealed preferences identified in a survey and by post-disaster development patterns. GIS was used to analyze development patterns of post-disaster LIHTC development. These development patterns were compared with the stated preferences of LIHTC developers to identify variables of risk that influence LIHTC development during disaster recovery.

Case Study Design

The case study was designed using a single case study of a state impacted by hurricane disasters. Significant damage to affordable housing was also a factor required for case selection. Figure 4.1 provides a summary of the criteria that was used to guide the case study selection. Florida was chosen because of its vulnerability to hurricane hazards. More than 500 storms have hit the state since hurricanes were first recorded. Over 10% of these storms have been recorded in this century. The strongest hurricane to hit Florida since 2000 was Hurricane Charley which struck the Florida coast as a category 4 storm in August of 2004. Hurricanes Jeanne and Ivan followed, both as category 3 hurricanes. Hurricane Frances as a category 2 storm ended the forty-four day onslaught of hurricanes. President George W. Bush declared all of Florida a disaster area. Flooding, hurricane force winds, and storm surge damaged housing and infrastructure in multiple counties. Housing damages were well documented in a report filed by the Hurricane Housing Working Group, which was convened by Governor Jeb Bush to provide recommendations for housing recovery (HWG, 2005). The work completed by HWG was discussed in Chapter 3.

A Sampling Frame for Case Selection

A purposive sampling technique was employed in the case selection process. The goal of case study selection using this technique was to focus on specific characteristics of interest that will best help answer the question of how risk perception influences LIHTC development during disaster recovery. According to Maxwell (2005), purposive sampling is when, *''particular settings, persons, or events are deliberately selected for for the important information they can provide that cannot be gotten as well from other choices''* (p. 87). Teddlie and Yu (2007) further categorize purposive sampling into four goal areas: a) representativeness or comparability; b) special or unique cases; c) sequential sampling; and d) multiple purposive techniques. For this research, purposive sampling was used to pick a revelatory case that would yield the most information about a phenomenon of interest. The population of potential case study areas included states bordering the Gulf and/or Atlantic coasts that have experienced multiple hurricanes resulting in the declaration of a Presidentially-declared disaster area for impacted counties or parishes. Housing losses, particularly affordable housing, was also a significant case study criteria. Developers of LIHTC multi-family housing, both non-profit and for-profit, were included in the boundary of the case study (Table 4-1).

Table 4-1: Case Study Selection Criteria

Case Study Criteria	
1.	Study area must be on the Atlantic and/or Gulf coast with coastal counties that are vulnerable to hurricanes.
2.	Study area must have been a Presidentially Declared Disaster area as a result of a past hurricane event.
3.	Study area must have been subject to floods, hurricane force winds, and storm surge.
4.	The hurricane event must have occurred between 2004 and 2008.
5.	The hurricane event must have been classified as a Category 2, 3, 4, or 5 on the Saffir-Simpson Wind Scale.
6.	Multiple coastal counties within the state must have had a loss of low-income and affordable housing as a result of the disaster.

Table 4-2 lists the Atlantic and Gulf coast states that experienced hurricanes between 2004 and 2008 resulting in presidentially declared disasters that met the criteria for the case study protocol. Each of the states affected were potential case study areas.

Florida was chosen because of the sheer impact of Hurricanes Charley, Frances, Ivan and Jeanne across the state. In 2004, four hurricanes struck Florida within a period of six weeks. Based on the extent of housing damages experienced in the aftermath, and the evidence of multi-family housing damage found in reports and in the literature, Florida was considered a good fit for this case study. Future research of other states impacted by Hurricanes Katrina or Sandy could reveal a relationship in development patterns identifying the paradox of risks identified in the survey and revealed preferences from location analysis in GIS. Future cross comparisons may also reveal patterns of growth that show how LIHTC development decisions evolve from an increasing knowledge of potential hazards. This revelatory case study is prepared as a baseline of LIHTC development patterns in Florida which can be adapted to analyze LIHTC in other coastal states.

Unit of Analysis

The unit of analysis in a case study is not always simple to define. The questions and proposition helped narrow the scope of this case study from the overall context of the impact of Hurricanes Charley, Ivan, Frances and Jeanne on the state. This study also analyzed risk from the perspective of LIHTC professionals during disaster recovery. Development patterns of LIHTC sites were analyzed using GIS, but development patterns alone were insufficient to determine risk. A LIHTC development can contain over 200

household units, or a small development can have as few as 20 household units. Risk was measured by the number of units developed in hazardous locations. The LIHTC household unit was an appropriate unit of analysis to identify exposed risk and was the primary unit of analysis for this study. A secondary unit of analysis is the development itself. The development consists of multiple units and is analyzed in the context of location within a storm surge along with the total number of units. Stated preferences for hypothetical barriers or incentives to development were analyzed to reveal other risk variables that provide additional context for the study.

Table 4-2: Potential Case Study Areas

Potential Case Study Areas							
Year	Hurricane	Category	States Impacted	Damages	Storm Surge	Flooding	Housing Losses
2004	Frances	2	FL	$9.5 billion[(1)]; 90% of damages occurred in Florida	< 6 feet	Yes	700,000 damaged units with 400,000 households having incomes under $30k (combined with Hurricane Jeanne) (Beven, 2014)
2004	Jeanne	3	FL	$7.6 billion	6 feet	Yes	
2004	Charley	4	FL	$15 billion	< 7 feet	Yes	Smith and McCarty (2011) found that Hurricane Charley caused the most damage to housing units during the 2004 hurricane season
2004	Ivan	3	FL	$18.8 billion	10-15 feet	Yes	In 2004, the Insurance Information Institute estimated that 1/5th of homes in Florida were destroyed or significantly damaged by the Florida 2004 hurricane season.[(2)]
2005	Dennis	3	AL; *FL	$2.5 billion in the U.S.	5 feet	Yes	Most housing damage occurred in the Carribean
2005	Wilma	3	FL	$21 billion	7 feet	Yes	
2005	Katrina	3	FL, LA, MS	$108 billion	25-28 feet	Yes	More than 1,000,000 housing units along the Gulf Coast were damaged
2005	Rita	3	LA; TX	$12 billion	10-15 feet	Yes	Over 33,000 homes were damaged in Louisiana and Texas
2008	Ike	2	TX; LA	$29.5 billion	10-20 feet	Yes	$3.4 billion in estimated housing damages
2008	Gustav	2	LA	$4.6 billion			

(1) Beven, J. L. (2014) Tropical Cycle Report, Hurricane Frances, National Hurricane Center

(2) Dumm, R.E., Sirmans, G. S., and Smersh, G. (2009) The Capitalization of Stricter Building Codes in Miami, Florida House Prices, Florida State University.

Analytic Strategy

The volume of data collected in a case study requires a general analytic strategy that can be formed around theoretical propositions, developing case descriptions, using both qualitative and quantitative data, and examining rival explanations (Yin, 2009). For this study, data was collected and organized around the proposition and specific research questions. The goal of the study was to explore revealed preferences which were used to identify variables of risk that influence LIHTC investment and location decision-making during disaster recovery. Yin (2009) outlines a series of iterations that lead to explanations as follows:

- An initial proposition is made about the behavior.
- Compare findings against the proposition
- Revise the proposition
- Compare other details of the case against the proposition
- Repeat as often as needed

Case Study Protocol

The case study includes three methods of analysis organized in three phases. Phase I consists of the content analysis of Qualified Action Plans from 2004 to 2010. Phase II was a survey of LIHTC professionals identified as being active in a LIHTC development in Florida from 2000 to 2010. Phase III compared the findings of Phases I and II using GIS to perform location analysis. Each research method is explained in detail in this chapter. Datasets and research method are identified in Table 4-3.

Table 4-3: Case Study Protocol

Type of Evidence Collected	Data Collection Instruments	Method
Baseline location data for LIHTC housing prior to a disaster event	HUD LIHTC database.	GIS Analysis/Descriptive Statistics
Baseline storm surge data for project proximity to hazard areas	Historical storm surge maps using SLOSH model.	GIS Analysis/Descriptive Statistics
Qualified Action Plans	Analyzed to determine annual Location priorities of the public agency	Content Analysis
Temporal analysis of LIHTC locations from 2004 to 2010	HUD LIHTC database	GIS Analysis/Descriptive Statistics
Variables for Perception of Risk	Web-based Questionnaire	Descriptive and Inferential Statistics

Comparison of Phases

The data from Phase I identified the stated preferences of the QAPs published from 2004 to 2010 by the Florida Housing and Finance Corporation. In Phase II, developers identified stated variables that were analyzed to determine risk perception. Location risks identified in the survey were compared to the locations stated in the Phase I content analysis. In Phase III, revealed preferences were identified using geographic information systems (GIS) to calculate the number of LIHTC units constructed during the study period. The GIS analysis also identified LIHTC units in areas subject to storm surge from both Category 3 and Category 5 hurricanes. Comparisons were made against the variables identified in the survey with the location of LIHTC developments in relation to storm surge and hurricane impact areas. Location priorities in annual QAPs were analyzed to identify public policy preferences. Findings from the GIS location analyses were analyzed against policy preferences and stated developer preferences.

Threats to Validity and Reliability

Internal Validity

Establishing causal relationships is a test of internal validity (Yin, 2009). This study expected to identify certain risks associated with investment or disinvestment decisions by producers of affordable housing. However, inferences to relationships identified within the statistical analysis may be associated or related, but not causal. The sampling frame was the LIHTC database. The survey population was limited to professionals in the Florida LIHTC community chosen from the contact data in the HUD LIHTC database. The LIHTC program was legislated into existence in 1986. The pilot

study identified participants of LIHTC in South Carolina using counties impacted by Hurricane Hugo as the case study area. During the pilot, it was determined that early developers in the program were often no longer active in the profession due to retirement, a change in profession, and in at least one occasion, was deceased. For this study, the sample population was chosen from those professionals who were active in the profession from 2000 to 2011. The LIHTC database is the most comprehensive collection of LIHTC projects available. Data collection for the database has evolved but data is incomplete, usually because states leave fields blank or some data unknown. Updates are completed annually by HUD who provides statistics for general reliability of the database. Between 2004 and 2010, approximately 8.7% to 15.1% of projects placed in service had missing addresses. This was overcome by manually inputting an address found by an independent Internet search to verify location. Only one Florida property in Palm Beach County was discovered to have an erroneous address in the course of this study. Owner contact records were missing in 7.5% to 12.1% of the time, however many participants are included multiple times in the database. Typically LIHTC participants are involved with multiple properties therefore missing contact information was easily identified from other entries in the database. The "number of units" fields were missing data 6.4% to 14.1% of the time.

The LIHTC database includes projects that may no longer be bound by LIHTC restrictions. The first wave of LIHTC eligible to leave the program was constructed between 1987 and 1994. This study made no attempt to determine which LIHTC were no longer in compliance. Khadduri, Climaco, and Burnett (2012) studied LIHTC properties

that were eligible to leave the program and found that most continue to be affordable after the compliance period ends. The majority of owners recapitalize with new tax credits for rehabilitation. Others reposition themselves with market rate leases. Repositioning was found to occur most often when housing markets are strong. Since 1990, federal law requires a 15-year compliance period and an additional 15 year affordability period. While rental housing markets have improved since 2008, the number of LIHTC eligible to leave the program is unlikely to threaten the validity of this study.

The GIS analysis could overstate or understate the number of total developments units because of properties that have dropped out of the program or because of missing data. This study provides general data derived from the database in order to allow the reader to understand the scope of the problem. The primary focus of GIS analysis was to reveal location preferences for LIHTC development after the 2004 hurricane season. Non-compliant properties should not affect these results since developments coming out of compliance in 2004 were placed in service at the beginning of the program, and regulatory changes in 1990 insured the majority of LIHTC will remain compliant until 2020.

General data regarding the number of LIHTC located in the boundaries of potential storm surge could vary depending on a number of variables including wind direction, wind speed, and intensity. This study used preset MEOWs developed in the SLOSH model for Florida basins.

External Validity

The greatest threat to external validity is in establishing a way for findings to be generalized. Generalization for case studies is analytical in nature and developed in theory with which to compare empirical results (Rowley, 2002). Replication can be claimed when theory is supported by two or more cases. In a single case study such as this, generalization is less certain because of the unique characteristics of the case. In the course of this research, state programs and the impact of disaster vary with each incident and with each state. This study aims to create a baseline of perceived risk and development patterns post-disaster with the expectation that comparisons could be made from future case studies.

Reliability

According to Yin (2009), case study reliability requires that data collection procedures and a chain of evidence be documented and maintained. Record-keeping has been organized and is maintained in a case-study database. Hard copies of field notes are maintained and all documentation is being catalogued for easy access within the case study database. Reliability was also considered in the conduct of the survey. During the pilot study, it was discovered that earlier participants in LIHTC had left the business. It was also realized that many participants are involved with multiple developments each year. The selection process for identifying the sample of survey participants was changed to reflect these circumstances. The population was chosen from active participants in LIHTC from 2000 to 2010. Duplicate entries were removed. Potential respondents were then verified through web research to insure that they were still active in the LIHTC

industry. Phone calls were made to potential respondents to request participation and validate an email address so a link to the survey could be sent. Multiple emails were sent to respondents to further boost participation. When a GIS analysis was conducted of C5H storm surge, it was discovered that some properties were duplicated based on the varying degree of storm surge affecting a single development. Storm surge was classified in equally divided segments based on the total range of feet. One development could be impacted by storm surge in two ranges. In each case, multiple entries were randomly assigned one representative for that development. This eliminated duplicate counts of units for that development and avoided overstating damage estimates.

Construct Validity

This study identified risks associated with LIHTC development during disaster recovery. Risk was measured by ranking variables chosen by survey respondents when given a set of options from the STEEP categories. High preference variables represented high risk if that preferred variable was taken away. Variables with low preference scores indicated the variable represented less risk. Risk variables were identified and ranked in order of preference using a mean score. Risk was also measured and ranked using the total number of LIHTC units placed in high hazard areas placed in service annually between 2004 and 2010 within Category 3 and Category 5 storm surges. Location was analyzed using measurements of storm surge risk in feet and location based on the number of LIHTC units located within potential storm surge using the SLOSH model. Estimated damages were applied in U.S. dollars. Development patterns in non-coastal counties and along the paths of the 2004 hurricanes were also analyzed.

METHODS OF ANALYSIS

The case study was divided into three distinct methods of analysis conducted in three phases. Each phase uses one of three methods to identify preference. Content analysis and a survey were used to obtain stated risks from the public agency and from the socially constructed influences of the developer. Revealed preferences were analyzed using geographic information systems.

PHASE I: CONTENT ANALYSIS

Documentation relating to a specific disaster can be prolific because government agencies and others organize and monitor the phases of disaster from response to recovery. This research focused on documents that influence LIHTC developer decision-making. The document most relevant to the research questions, and targeted to the LIHTC industry, is the Qualified Action Plan (QAP). This document sets the protocol for State housing needs and dictates how federal tax credits will be prioritized. QAPs examined during the South Carolina pilot study had points and thresholds that identified preferences. This language communicated location preferences by establishing quantitative measures to gauge priority. During disaster recovery, supplemental QAPs may also be issued to encourage housing recovery efforts. During Hurricane Katrina, Louisiana issued multiple QAP supplements as policy changes and additional housing recovery strategies were implemented. However this was not the case in Florida which issued a single QAP each year through the study period. Florida QAPs differed from those issued during Katrina and those analyzed during the pilot study. Preferences were

communicated using the words *targeted, threshold* or *set-aside* rather than a quantifiable scoring method. Florida QAPs were collected and analyzed from 2004 to 2010.

Phase one of this study examined Qualified Action Plans (QAP) from 2003 to 2010 using content analysis to determine location preferences of the Housing Authority in the State of Florida as established within the QAP. The QAP for 2003 was examined as a baseline to understand the language of the Florida QAP layout prior to the 2004 hurricane season. States generally create QAPs using a template that is revised each year. Any deviation in language for location preferences from the 2003 QAP was easily identified.

The initial review of QAPs included a search for points, set-asides, or thresholds that gave preferences for location. Some states use a point system to establish preferences within the QAP. Such was the case of South Carolina during the pilot study. Florida does not use this system. In Florida, points were applied in the Universal Application (UA) for LIHTC, and while this study did not examine UAs, a preliminary review of several UAs was completed and findings indicated that points were most often applied to design features of units or property amenities as opposed to geographical preferences. Geographic set-asides were also distributed between large, medium, and small counties based on the state's most recent market study. Market studies are completed in conjunction with a Consolidated Plan required by HUD for the allocation of HOME funds or CDBG. While not required for LIHTC allocations per se, the Consolidated Plan is often instrumental in the creation of Qualified Action Plans so that

available sources of funding can be directed to the most pressing housing needs within the state.

Set-asides are "pools of tax-credit funds within which applicants compete only against other properties qualifying for the set-aside" (Khadduri, 2013). Geographic set-asides were established for Florida Keys communities, Rural Development, and Front Porch Florida Communities. Set-asides in the QAPs examined for this study were not applied to locations specifically impacted by the 2004 hurricanes.

Thresholds are another means of stating public preferences in the QAP. Thresholds establish a minimum baseline that can have the effect of excluding properties from the bidding process altogether (Khadduri, 2013). Thresholds were not explicitly established in the documents examined for this study, but were referred to as minimums to be met in accordance with the UA. For instance, threshold requirements for Rural Development, Florida Keys, and Front Porch Communities were geographical threshold requirements ranked in the UA, however specific points were not applied making it difficult to determine the priority of a specific location. Thresholds were also noted for developments that received additional funding through tax-exempt bonds. Future studies are needed to dissect scoring and threshold priorities of Florida UAs as they relate to hurricane prone properties. Since points are not applied for every category of the UA, selection appears to be subjective. Given the subjective nature of the UA, future studies would also benefit from interviews with a representative of the public housing authority to understand how scoring and LIHTC selection are accomplished in Florida.

Location preferences are stated in the QAP and are the most direct communication of public preferences for LIHTC allocations. All Florida QAPs examined included a heading for location under Section I of the Selection Criteria. In every document analyzed for this study, selection criteria was scored and ranked in the UA according to priorities established under Section II, Priorities of the QAP. Section I, defined how those priorities would be targeted.

Florida QAPs revealed specific language used to communicate preferences for preferred characteristics of LIHTC developments. Keywords were identified to further analyze each document in order to determine if specific counties impacted by the 2004 hurricanes were targeted. Each document was imported to software that enabled a searchable format. Keywords were entered and a search was completed to determine location preferences established within the QAP. The keywords used for the content analysis were *targeted, gives preference, set-aside, threshold,* and *location.* Using these keywords, location priorities for counties impacted by the 2004 hurricanes were found in QAPs for years 2005 and 2006.

PHASE II: SURVEY ANALYSIS

A web-based survey was conducted using Qualtrics and included both closed- and open-ended questions. The survey included questions designed to identify and rank preferences measured as risk for LIHTC during disaster recovery.

Survey Population

The study population is LIHTC developers identified in the HUD LIHTC database and were limited to those that at minimum operated within Florida, but this

group may also participate in LIHTC development in multiple states. Project contacts are included in the database by name, company, and phone number. In the course of the Pilot study, it was found that the database includes professionals that work in LIHTC as syndicators, developers, investors, management, or finance. This case study focused on LIHTC in Florida, therefore a random sample was drawn from the population of Florida LIHTC. The formula for sample size was based on Dillman et al. (2011) which considers the total population and a conservative estimate of the proportion of the population that would provide varying answers to a two response category with a 90 percent confidence interval and a margin of error of ± 5 percent. One hundred forty three contacts were randomly chosen to participate in the survey. The survey asked questions along three general categories: *demographic, location, and funding.*

Rationale for Selection of Survey Method

The purpose of using a survey was to get a sense of how decision-makers in the industry view disaster risk. Under the paradigm of social constructivism, LIHTC professionals were expected to draw from personal and professional experiences to identify preferences for LIHTC development during disaster recovery. The survey developed for this study included a series of hypothetical statements to establish a perceived level of risk under five general categories: *social, technical, economic, environmental,* and *government.* The survey used here was an exploratory tool that attempted to analyze an initial set of variables of perceived risk associated with disaster recovery within the sample population. The goal of the survey was to reveal variables of perceived risk that relate to development decisions in the aftermath of disaster. The

survey was conducted on a random sample of all LIHTC developers who were associated with any of the completed projects within the case study area regardless of their participation in recovery efforts.

Procedures for Administering Survey

The survey was administered online using Qualtrics, an online survey platform. According to Dillman et al (2011) web based surveys are especially useful in business settings where most participants have access to Internet services. The participants email addresses were acquired either by telephone or through an online search of company contact information. Participants were contacted by phone to confirm email and provide details about the study. Participants were emailed a link to the survey and were given thirty days to complete the questionnaire. A weekly reminder was sent to each respondent with a final reminder sent two days before the final deadline. There is no evidence that the length of time given for the survey affected the response rate.

Measuring Risk

For this study, preference is measured using either a seven point Likert scale or a ten point sliding scale. Risk is derived by measuring a mean and standard deviation from risk statements. Categories of risk include *social, technical, economic, environmental,* and *government* (Table 4-4). These categories reflect macro influences on development decisions.

Funding risk was measured using a 7-point Likert scale. Respondents were asked which funding source was most likely to incentivize LIHTC development in an impact zone. A program that was likely to encourage development was identified as a low risk whereas a funding source that was very unlikely to incentivize development was considered high risk. In addition to the mean, which was calculated throughout the survey, this question was analyzed further using inferential statistics to test the significance of the mean. This same inferential analysis could be applied to other questions in the survey to gain a more comprehensive interpretation of the results.

A second question also focused on funding sources that could be combined with LIHTC during disaster recovery. Respondents were asked which funding sources were critical to participation in the LIHTC program (Table 4-5). A program that was not critical to development represented a high risk. A critical program indicated low risk.

Table 4-4: Measuring Categories of Risk

Variable	Low Risk	High Risk
	Go	***No Go***
Social	0	10
Technical	0	10
Environmental	0	10
Economic	0	10
Government	0	10

On a ten point sliding scale, non-critical programs had a low score of 0, meaning the program had no influence on affordable housing production. A high score of 10 was an indicator that a program that was extremely critical to LIHTC development during disaster recovery, meaning the program was significant in reducing risk for the developer.

Table 4-5: Measuring Funding Risk

	Not critical	*Extremely Critical*
Program	**High Risk**	**Low Risk**
CDBG	0	10
HOME Funds	0	10
Supplemental LIHTC	0	10
Disaster Bonds	0	10
Mitigation Grants	0	10
Federal Disaster Loans	0	10
SBA Loans	0	10
Traditional Financing	0	10
Physical Disaster Business Loans	0	10
Federal Disaster Grants	0	10
Private Insurance	0	10
Road Home Small Rental Property	0	10
New Market Tax Credits	0	10
Other	0	10

Location risk was measured with a 10-point sliding scale that identified a potential site as most preferred, or low risk, and least preferred, which was considered a high risk site (Table 4.6).

Table 4-6: Measuring Location Risks

Location Risk	*Most Preferred*	*Least Preferred*
	Low Risk	High Risk
Adjacent to a previously flooded site	10	0
Upcoming election may change disaster recovery priorities	10	0
Site is in a coastal county	10	0
Site is not in a coastal county	10	0
Site is 1 to 5 miles from the coast	10	0
Site is 5 to 10 miles from the coast	10	0
Site is > 10 miles from the coast	10	0
Site is > 25 miles from the coast	10	0
Site is not within a storm surge boundary	10	0
Site is within a Storm Surge boundary	10	0
Site could flood during a hurricane	10	0
Site has some potential for storm surge	10	0

A final set of close-ended questions attempted to measure externality risks under the broader terms of social, political, and economic interests. An externality is a cost or benefit that accrues to an owner or producer over which they have no control, such as insurance costs or regulations. These questions were asked using a 10-point sliding scale with 0 being an unwillingness to participate, indicating greater risk, and 10 being willing to participate, or an indication of no risk (Table 4-7).

Table 4-7: Measuring Externalities

Measuring the Risk of Externalities	Low Risk	High Risk
Financing the project has unfavorable terms	10	0
Insurance costs are higher in a coastal area	10	0
Construction costs are rising in the recovery zones	10	0
Land costs are higher along the coast	10	0
More regulations are imposed in coastal counties	10	0
A local neighborhood group is against low-income housing	10	0
Public sentiment is against low-income housing	10	0
A for-profit organization is willing to partner in developing the project	10	0
A non-profit organization is willing to partner in developing the project	10	0
More flexible regulations in a non-coastal county	10	0
Construction costs are stable in the recovery zones	10	0
Additional incentives are available to build in coastal counties	10	0
Insurance costs are lower in counties that are not along the coast	10	0
An advocacy group supports low-income housing in a specific community	10	0
Land costs are lower in areas away from the coast	10	0
Disaster relief programs are available for low-income multifamily housing	10	0
Financing the project with favorable terms	10	0
Supplemental tax credits are available	10	0

There are some limitations to the survey. Inferring cause-and-effect relationships is an interpretive matter in survey research (Singleton and Straits, 2005). The standardized nature of a survey questionnaire represents only surface details of the developer's experiences. The survey questionnaire was used to identify and rank stated preferences of perceived risk by LIHTC developers operating in the state of Florida during disaster recovery.

The LIHTC database includes data collected since the program began. Data collection processes have evolved over that time resulting in some missing and erroneous

data. When obvious errors were encountered, such as incomplete addresses or phone number errors, duplicates were compared within the database itself.

Data Collection and Analysis

An attempt to contact the developer by phone was the initially preferred means of engagement with the LIHTC professional. During the pilot study, it was discovered that contact phones numbers often were no longer in service or linked to the contact by a company cell phone that was no longer in use. Many contacts were associated with multiple companies as a result of job changes, company structure, or company changes. Online sources such as LinkedIn and company websites were used to update phone numbers. An attempt was made to contact each participant by phone to explain the research and get an email address. Others not reached by phone were sent a link by email with an explanation. Of 143 randomly selected records, a link to the web-based survey was emailed to a sample population (n=112). Thirty three participants completed the survey indicating a response rate of 29%.

Response Rate

The survey for this study was administered to business professionals who often report low response rates (White and Luo, 2005). In an effort to boost response rates, White and Luo tested the use of monetary incentives and a long versus short form survey. According to Dillman (2000), monetary incentives are useful in improving mailed surveys, second only to multiple contacts. White and Luo found that rewards of $10 and $20 improved response rates for paper-based business surveys. For this survey, incentives were not provided, however multiple reminders were sent. Short form surveys

were found to illicit a higher response rate at the expense of a loss of detail in the data received. These results concur with Greer et al. (2000) who found that questionnaires with fewer pages resulted in higher return rates. Others have found no significant difference in return rates between longer or shorter surveys (Hager et al., 2003).

In one of the earlier studies examining online survey response rates, Cobanoglu, Warde, and Moreo (2001) tested response rates on surveys given to professors specializing in the hospitality industry and found response rates were highest for online surveys at above forty-four percent. Faxed surveys elicited a 17% response rate and a 27% was found for mailed surveys.

While financial incentives can improve response rates (White and Luo, 2005; Nulty, 2008), others have found that network associations are beneficial for boosting responses (Bartholomew and Smith, 2006). An association with organizations that specialize and promote LIHTC in the housing industry, such as the National Association of State and Local Equity Funds or Novogradac & Company, may have boosted response rates for this study. However, this study was limited in scope focusing specifically on LIHTC participants with experience in the State of Florida where hurricane hazards are a predominant disaster risk. Therefore a decision was made to personally contact professionals who have demonstrated participation with LIHTC on the Florida coast.

Statistical Analysis

Respondents were given a list of funding incentives and were asked *"Given the following incentives, how likely would your company be willing to build a LIHTC multifamily development in an impact zone that has sustained severe damage from a*

hurricane disaster?" Using a 7-point Likert scale with 1 being very unlikely (meaning greater risk and 7 being very likely (meaning less risk), descriptive statistics were analyzed for the mean and standard deviation. Inferential statistics were conducted using SPSS to test the means and standard deviation followed by multivariate analysis to determine correlation between variables[6].

A similar analysis was conducted on a question that asks "*When thinking about disasters, please rate the location preference for each of the following for a potential LIHTC development*." A sliding 10 point scale was given to the respondent with 0 being least preferred, indicating a site with greater risk, to 10 being the most preferred site, indicating less risk. Like the previous question, inferential statistics were conducted using SPSS to test the means and standard deviation. Multivariate analysis was conducted to determine if any correlation exists between variables.

PHASE III: GEOGRAPHIC INFORMATION SYSTEMS

Schensul, Schensul, and LeCompte (1999) define archival data and secondary data as qualitative and quantitative data *"collected and stored for research, service, and other official and unofficial purposes by researchers, service organizations, and others."* This type of data generally falls into three categories: public data sets, private data sets, and private records. This study used public data sets that included historical SLOSH

[6] Note that cross tabulations were proposed for this study to analyze the differences between For-profit and Non-profit business models. However, given the small sample size and insufficient responses within cells, cross tabulations were inappropriate for this study. Implementing this or a similar survey to a larger LIHTC sample population could result in a greater response rate sufficient to derive meaning from an analysis of cross tabulations.

model storm surge data and the HUD LIHTC database. The pilot study needed to account for only one Universal Trans Mecator (UTM) Zone. Florida is divided in two UTM Zones: NAD83/UTM 16 and NAD83/UTM 17. Zone 16 consists of 15 counties in the northwestern quadrant of the state. The remaining counties are located in UTM Zone 17. The majority of data was analyzed using GIS spatial analysis projected to NAD_1982_UTM_Zone17N (Table 4-8).

Table 4-8: GIS Datasets and Limitations

Datasets	Source	Limitations	Projection	
			From	To
SLOSH Model	National Weather Service	Storm surge SLOSH models are subject to error; access to storm surge risk maps and raw data may not be available	GCS_North_American_1927	NAD_1982_UTM_ZONE_17N
LIHTC Database	To analyze locations of LIHTC projects in relation to proximity to hazard areas identified by FEMA and Storm Surge data before and after a disaster event.	Subject to input error and missing data	GCS_North_American_1983	NAD_1982_UTM_ZONE_17N
Florida County Map	2012 TIGER/Line Shapefiles - U.S. Census		GCS_North_American_1983	NAD_1982_UTM_ZONE_17N

Using descriptive statistical analysis, the number of LIHTC placed in service (PIS) was calculated by unit for each year of the study period. A storm surge analysis was completed for each Florida basin except the Okeechobee basin located inland at the southeast quadrant of the state west of Palm Beach.

This study used the SLOSH model to identify the number of LIHTC developments and units located in potential storm surge from a Category 3 storm with a mean tide (C3M) and a Category 5 storm at high tide (C5H) to identify an average and

worst case scenario for hurricane damages. Basins were constructed within the SLOSH model and exported to shapefiles for ArcGIS (ESRI, 2013). Storm runs were created using the Maximum Envelope of Wind (MEOW) with the highest wind speed available for each category of storm. During the pilot, a select number of counties were analyzed and compared for the number of LIHTC located in storm surge and flood zone areas. At the time of this study, flood zone maps were being recalculated by the Federal Emergency Management Agency and were incomplete for analysis. Counties across the country monitor flood zones and often have ordinances and codes that limit or discourage development in these areas. In Florida, the high cost of flood insurance is well understood to be a factor in development decisions for all property types (Anderson, 2015). What is less understood is the impact on LIHTC development in storm surge areas. Estimates of economic impacts were not included in the pilot study. In this study, GIS identified those LIHTC properties in storm surge areas and estimated the economic impact of a C3M or C5H storm surge.

Rationale for Use of Archival Records

The HUD LIHTC database is the most comprehensive collection of LIHTC development. States collect comprehensive annual data for every LIHTC development in the country. The data is subject to error. Errors were corrected when noted. In spite of any relatively minor shortfalls, the database is the most reliable public source of LIHTC available to researchers. The SLOSH model was developed by NWS and NOAA and is often used by emergency managers to monitor and predict storm surge potential (Glahn et al, 2009). TIGER/Line files are often relied upon for analysis in GIS. These three data

sources were used to observe development patterns before and after the 2004 hurricane season. Proximity of LIHTC projects to historical storm surge boundaries for a C3M storm surge and a C5H storm surge were also analyzed.

General Limitations

Archival records are typically produced for a specific purpose. LIHTC files are collected and made accessible for public access and general research purposes. As stated before, accuracy is not guaranteed and limits the study. The LIHTC database is maintained by HUD based on submissions from each state. It is very unlikely that missing data had a significant impact on findings.

O'Looney (2000) identified five categories of data quality for GIS applications: *positional accuracy, attribute accuracy, completeness, logical consistency,* and *lineage.* Each of these categories are discussed in terms of general limitations for this study.

1. Positional accuracy is defined as *"the degree of horizontal and vertical control in the coordinate system"* (p. 45). Florida is divided into two UTM coordinate systems. This study recognized both systems and analyzed units in storm surge hazards according to the appropriate UTM.
2. Attribute accuracy is the *"degree of error associated with way thematic data is categorized"* (p.45). In this study, longitude and latitude coordinates in the LIHTC database were relied upon. Field visits and engineering surveys are likely needed to measure the level of accuracy between the storm surge boundary and the number of units actually within those boundaries. Category 5 storm surges estimated for this study resulted in some LIHTC developments being counted

twice. Further investigation revealed that more than one range of depth for storm surge was being applied. For this study, duplicate counts were removed to avoid double counting of units.

3. Completeness is the degree of missing data and missing data is treated. The LIHTC database does have some missing fields, and others fields that have entries and blank fields. This was especially apparent during the pilot study when attempting to identify funding sources and non-profit participants. GIS analysis for funding sources and non-profit participants is limited to those records that were available with the understanding that data is incomplete. When recognized, incomplete data has been pointed out in the findings and considered in the analysis.
4. Logistical consistency looks for contradictions within a database. The LIHTC database contains LIHTC locations based on input from states. Logical consistency infers that one entry may be based on duplicate factors. Logical consistency is not a limitation for this study.
5. Lineage is the chronology of data and estimates used for processing data. The LIHTC database has consistent fields with content supplied by each state. Some states may not report all fields which would create inconsistency in a multi-state study. This case study focused on a single state and it is expected that data collection has been consistent except in those areas identified in the findings.

The next chapter discusses each phase of this case study. The findings and analysis for each phase are presented and analyzed to determine how risk influences LIHTC development.

Chapter 5

AN ANALYSIS OF RISK

The purpose of this revelatory case study was to understand how LIHTC developers perceive risk and identify variables of risk that influence decisions during disaster recovery. Phase I of this study identified the stated preferences of the Florida Housing and Finance Corporation (FHFC) acting as the public agency. Location preferences for areas with housing damages were found in Qualified Action Plans for 2005 and 2006. Phase II of this study asked LIHTC professionals to state preferences in a series of competing choices. Respondents were asked to rank variables that were most likely to incentivize development. Open ended questions provided an opportunity to contribute ideas for encouraging development of affordable housing during recovery which contributed to an understanding of risk perception. Phase III applied descriptive statistics using geographic information systems (GIS) to identify revealed preferences of developers using location analysis of LIHTC placed in service. There are two dates associated with LIHTC. The first is the allocation date. The allocation date is the year the tax credits were assigned to the project. The second date is the year 'placed in service', which is the year the development was completed and occupancy was verified. A development is typically placed in service (PIS) within one to two years of the allocation. PIS is the date relied on in Phase III of the study.

PHASE I: STATED PREFERENCES OF THE PUBLIC AGENCY

Qualified Action Plans (QAP)are created in a collaborative process with input from stakeholders in the months prior to its publication. Stakeholders include non-profit organizations, local housing authorities, private developers, and advocates for affordable housing. The 2004 QAP was introduced to the public months before the hurricane season and funding was likely underway or complete by the time the storms hit. There would have been ample time, however, to modify the 2005 QAP to accommodate housing needs resulting from the storms.

In this analysis, the public agency refers to FHFC, the state housing agency responsible for allocating tax credits. The QAP is a compilation of preferences established by federal, state and local governments through policy statements, and regulations. After the 2004 hurricanes, Governor Jeb Bush convened the Hurricane Housing Working Group (HWG) to gather data and recommend action to facilitate affordable housing recovery. The recommendations of the HWG were discussed in Chapter 3 and were compared to QAPs to analyze policy statement influences. The 2005 and 2006 QAPs incorporated many HWG recommendations for allocating resources. In 2005, the QAP preferred all locations identified by HWG as a Tier I priority likely as a result of damages more so than policy statements. The 2006 QAP incorporated additional locations from Tiers II, III and IV and eliminated some Tier I counties.

The Hurricane Housing Working Group

States often retain some flexibility that will allow LIHTC awards to be given based on non-numerical priorities. The State of Florida is no exception. Priorities were established in the months immediately following the 2004 hurricanes by targeting counties most impacted by the storms. Four priority tiers were established by the Hurricane Housing Working Group (HWG) based on severity of damages that occurred by county. HWG also factored in the total number of housing losses when prioritizing housing needs (HWG, 2005). These statistics formed the basis of policy priorities recommended to the governor and state legislature.

In 2005, the year immediately following the storms, the HWG analysis was incomplete. As a result FHFC was unable to incorporate the findings even though the 2005 QAP ultimately concurred with HWG recommendations. Location priorities for 2005 were established for eleven counties impacted by the storm. These counties were identified as: *Brevard, Charlotte, De Soto, Escambia, Hardee, Indian River, Martin, Okeechobee, Polk, St. Lucie,* and *Santa Rosa* (Figure 5-1). Each was a Presidentially Declared Disaster Area and received emergency assistance and access to needed disaster relief. All eleven counties were included in the Tier I group (See Table 5-1). Seven were coastal counties and four were inland. DeSoto, Hardee, and Okeechobee counties are considered small, rural inland counties, meaning the population is less than 100,000 and density is less than 100 individuals per square mile. Charlotte, Escambia, Indian River, Martin, Santa Rosa, and St. Lucie are considered medium counties with a population of between 100,000 and 500,000. These counties are located on the coast. Brevard and

Polk counties are large counties with populations of greater than 500,000. Polk is an inland county and Brevard is located on the coast. Polk County was hit by three of the four hurricanes.

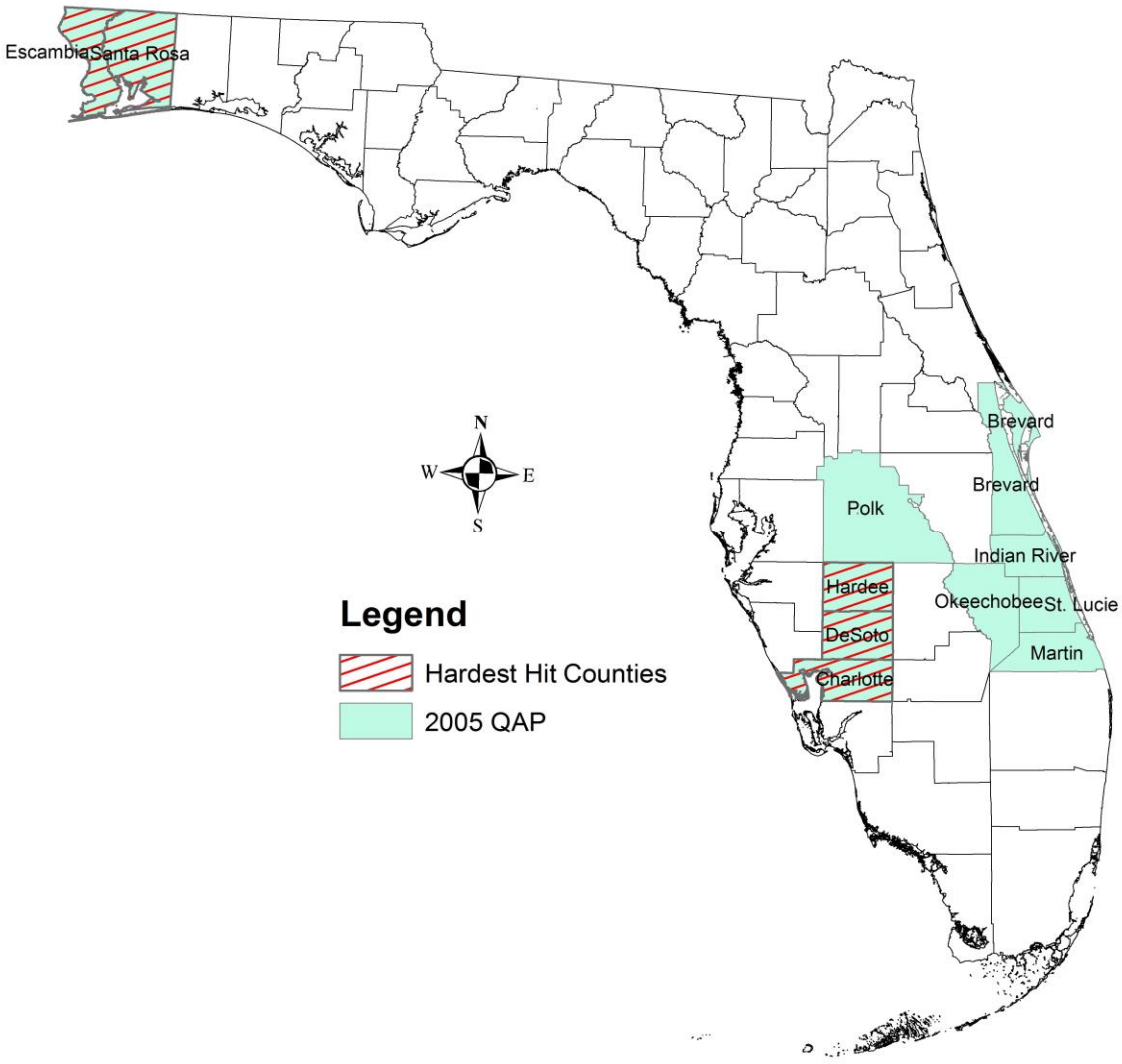

Figure 5-1: 2005 QAP Preferences

In 2006, only five counties in Tier I were given priority in the QAP (Figure 5-2). Four of these were coastal counties. Hardest hit counties were excluded from the 2006

QAP even though allocations for LIHTC in one or more hardest hit counties continued through 2009. The 2006 QAP also included preferences for seven additional counties located in the remaining tiers. Tier III included two non-coastal counties and Tiers II and IV included only coastal counties. No other location preferences relating to the 2004 storms were established in QAPs between 2004 and 2010.

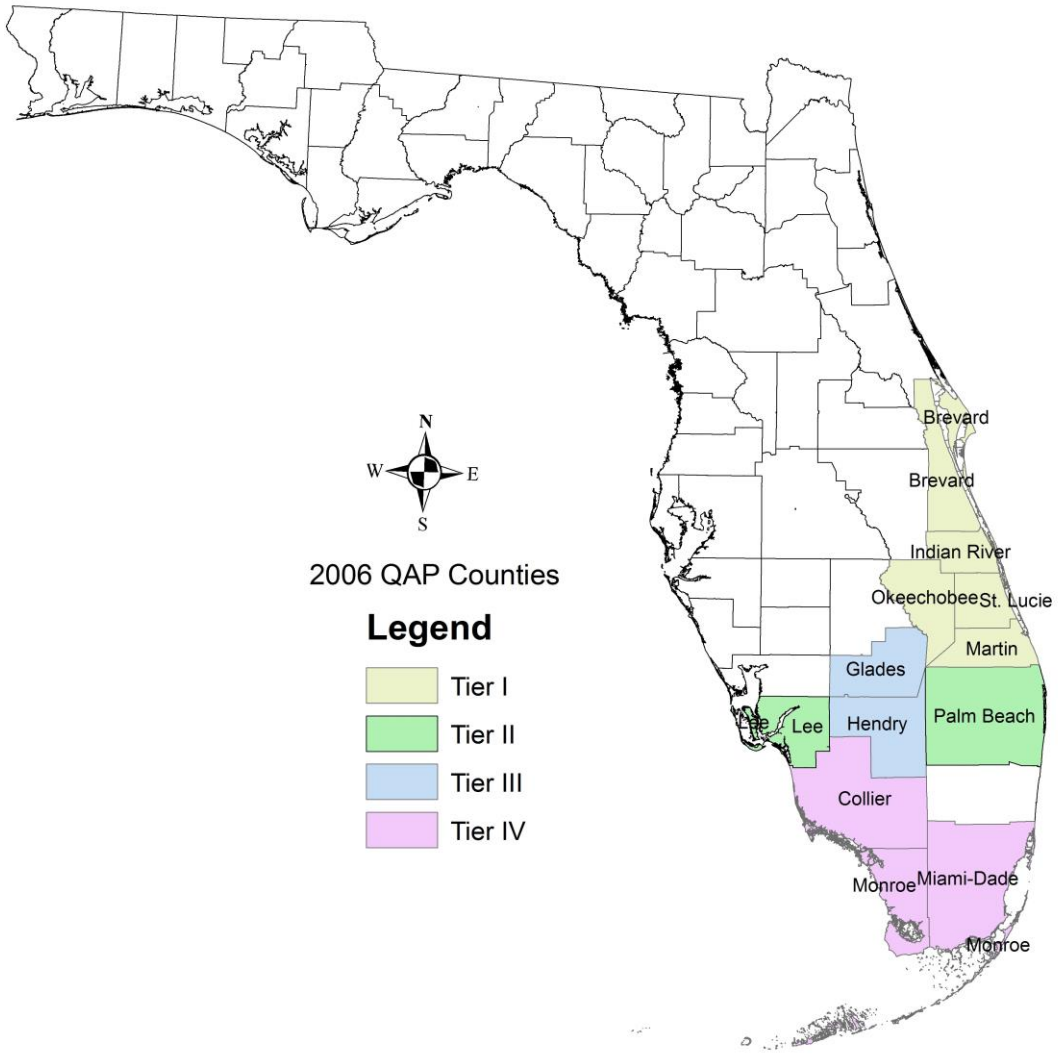

Figure 5-2: 2006 QAP Preferences

Table 5-1: Comparison of HWG Report with 2005 and 2006 Qualified Actions Plans

HWG Report	2005 QAP	2006 QAP	Coastal Counties	Non-Coastal Counties
Tier I				
Hardee	x			x
DeSoto	x			x
Okeechobee	x	x		x
Martin	x	x	x	
Santa Rosa	x		x	
Indian River	x	x	x	
Charlotte	x		x	
Polk	x			x
St. Lucie	x	x	x	
Escambia	x		x	
Brevard	x	x	x	
Tier II				
Lee		x	x	
Palm Beach		x	x	
Tier III				
Glades		x		x
Hendry		x		x
Tier IV				
Collier		x	x	
Miami-Dade		x	x	
Monroe		x	x	
Total	**11**	**12**	**13**	**6**

Tier I	11	5	8	4
Tier II	0	2	2	0
Tier III	0	2	0	2
Tier IV	0	3	3	0

The Hurricane Housing Working Group reported that Tier I counties experienced over 47% of total housing damages. Housing was categorized by single-family, multi-family, and manufactured housing. Multifamily housing (MFH) was only 3% of total damages in all Tier I counties combined. However, on a per county basis, most Tier I counties had significant damage in their multifamily housing stock, especially Hardee with 36.5% and St. Lucie with 30.6% of total MFH damaged. De Soto County had the next highest percentage of damages with 29.1% of its MFH stock followed by Charlotte, Indian River, Santa Rosa, and Okeechobee counties (Table 5-2). Brevard, Polk, and Martin counties had less than 10% of MFH stock damage or destroyed.

Table 5-2: Housing Damages

County	Total		Single Family		Multi-Family		Manufactured Housing		Tier
	# of Units Damaged	% of Total Units County	# of Units Damaged	% of Total Units County	# of Units Damaged	% of Total Units County	# of Units Damaged	% of Total Units County	
Hardee	5,570	64.1%	3,741	61.7%	193	36.5%	1,626	77.4%	I
De Soto	7,506	64.3%	4,314	65.1%	350	29.1%	2,829	72.8%	I
Okeechobee	7,668	53.4%	3,946	57.2%	136	17.5%	3,570	53.5%	I
Martin	19,343	32.1%	14,018	37.3%	1,510	9.4%	3,519	56.6%	I
Santa Rosa	23,196	46.9%	18,518	50.5%	879	19.9%	3,409	40.6%	I
Indian River	29,460	53.5%	22,804	62.5%	2,749	21.5%	3,660	63.1%	I
Charlotte	34,077	48.0%	27,918	53.0%	2,384	23.6%	3,673	44.8%	I
Polk	49,809	23.4%	34,346	26.9%	2,850	9.1%	12,465	23.4%	I
St. Lucie	51,627	60.4%	39,930	64.8%	4,666	30.6%	6,647	76.9%	I
Escambia	51,876	2.7%	41,922	48.2%	4,024	17.2%	5,077	45.5%	I
Brevard	56,698	26.0%	43,127	28.6%	3,921	8.4%	8,492	40.9%	I
Tier I Total	**336,830**	47.6%	**254,584**	35.9%	**23,662**	3.3%	**54,967**	7.8%	
State Total	*708,361*								

Source: Hurricane Housing Working Group, 2005; Shimberg Center for Affordable Housing, 2004

Tier II counties were classified as having either large numbers of housing damages, or a large percentage of housing damages compared with the total statewide. Two Tier II counties were included in the 2006 QAP. Lee County reported 20,761 housing units damaged from the storms (Table 5-3). This was 9.4% of total damages reported in the state. Less than two percent of these were MFH. There were 1,179 damaged or destroyed MFH units in Lee County. Compare this to Palm Beach County with 16.3% of the state total, or 84,001 total housing units. The greatest numbers of damaged multifamily units were located in Palm Beach County with just under 6% of the state, or 11,715 units damaged.

Glades and Hendry counties were Tier III counties and together had slightly more than five percent of total MFH housing. Hendry counted 34 damaged MFH units, or slightly above three and a half percent of the total. Glades had less than ten. When ten or fewer units were damaged, exact numbers were not published in order to protect privacy. Together, Hendry and Glades accounted for more than 11% of the total housing damaged or destroyed as a result of the 2004 hurricanes. These two counties represent 18% of the total number of counties included in Tier III.

Monroe, Collier, Broward, and Miami-Dade had less than two percent of damaged housing in the state and were included in the Tier IV category. These four counties represented just 10% of all counties in Tier IV. The greatest number of MFH damages was in Miami-Dade with 2,458 MFH units reported damaged.

Table 5-3: 2006 QAP - Tiers I, II, III & IV

County	Total		Single Family		Multi-Family		Manufactured Housing		Tier
	# of Units Damaged	% of Total Units County	# of Units Damaged	% of Total Units County	# of Units Damaged	% of Total Units County	# of Units Damaged	% of Total Units County	
Monroe	25	0.1%	19	0.1%	*	0.0%	*	0.0%	IV
Collier	334	0.3%	254	0.4%	20	0.0%	59	0.7%	IV
Glades	505	11.6%	204	10.8%	*	1.6%	297	13.1%	III
Hendry	1,317	11.3%	632	11.1%	34	3.6%	650	13.0%	III
Broward	6,932	1.0%	5,251	1.4%	985	0.3%	408	1.9%	IV
Okeechobee	7,668	53.4%	3,946	57.2%	136	17.5%	3,570	53.5%	I
Miami-Dade	9,481	1.1%	6,289	1.4%	2,458	0.7%	488	3.6%	IV
Martin	19,343	32.1%	14,018	37.3%	1,510	9.4%	3,519	56.6%	I
Lee	20,761	9.4%	16,577	12.5%	1,179	1.9%	2,951	10.8%	II
Indian River	29,460	53.5%	22,804	62.5%	2,749	21.5%	3,660	63.1%	I
St. Lucie	51,627	60.4%	39,930	64.8%	4,666	30.6%	6,647	76.9%	I
Brevard	56,698	26.0%	43,127	28.6%	3,921	8.4%	8,492	40.9%	I
Palm Beach	84,001	16.3%	60,351	20.1%	11,715	5.9%	7,794	45.3%	II
Total	**287,793**	40.6%	**213,129**	30.1%	**29,353**	4.1%	**38,476**	5.4%	
State Total	*708,361*								

Source: Hurricane Housing Working Group, 2005; Shimberg Center for Affordable Housing, 2004

PHASE 1: Findings and Analysis

Every county in Florida was affected by the 2004 hurricanes (HWG, 2005). Comerio (1998) noted that most disaster relief is dispersed to owners of single-family homes, *"even when losses are predominantly in multi-family structures"* (p. 21). LIHTC development is a significant source of multifamily housing production, especially during recovery. Vacant LIHTC units are often used to shelter others during the transition between response and recovery. After disaster, policies often relax recapture rules so vacant units can be rented to those who would not normally qualify under income restrictions. Damaged LIHTC units are also given an extended period of time to be repaired without risk of recapture. Policies also begin to develop to address inevitable

shortages of affordable housing, shortages that were likely exacerbated as a result of the disaster event.

Qualified Action Plans provide evidence of the preferences guided by public policy. It was assumed that the public agency sought location preferences in counties that indicated a serious need for additional affordable housing units and that all the usual means of determining location needs took place in a collaborative way among stakeholders. It is also assumed that state preferences recommended by HWG played a role in the public agency's decision making.

The analysis of QAPs indicated a preference for counties that experienced the greatest impact from the four hurricanes. This is especially the case for location preferences stated in the 2005 Florida QAP. While the HWG was still convened and analyzing damages, the FHFC was proactive by including the counties directly hit by one or more hurricanes. St. Lucie was hit by Hurricanes Jeanne and Frances, resulting in the most severe housing damage. Indian River and Brevard counties also experienced extensive housing damage, reportedly from storm surge (HWG, 2005). Indian River, Brevard, and Polk Counties were affected by three of the four hurricanes. Ivan had the greatest impact to the south damaging housing in Miami-Dade, Broward, and Collier counties. Hurricane Ivan traversed northward across the Gulf of Mexico landing near Santa Rosa and Escambia counties causing even more damage. Santa Rosa County took a major hit and reported 46.9% of housing damages. Over 19% of those damages were to multi-family housing units. These counties were ultimately categorized as Tier 1 counties by HWG.

In 2006, the Florida Housing and Finance Corporation incorporated HWG recommendations and spread location preferences across a wider range of counties affected by the storms. While Tier I counties were the largest subset of counties preferred in the QAP, a few counties in the remaining tiers were given preference as well. Factors influencing the inclusion of Tiers II, III, and IV counties could be a result of preferences for small, medium and large counties, Florida Keys (Monroe County), or number of damaged housing in these counties. As a percentage of housing losses, Monroe, Collier, Broward and Miami-Dade are Tier IV counties were minimally impacted by Hurricane Ivan but were included in the 2006 QAP. The initial number of MFH damages between the four counties was estimated to be at least 3,463[7] (HWG, 2005). Lee, Hendry, Glades, and Palm Beach are Tier II and III counties located south of the path taken by Charley, Frances and Jeanne, and north of the southerly path of Hurricane Ivan. In other words, none of these counties sustained a direct hit from any of the four hurricanes. Yet all four counties were given preferences in the 2006 QAP, likely because of the total number of damaged units in these counties. Lee County had 20,761 total housing units damaged. Of these, 1,179 were multifamily housing. Hendry County had fewer units damaged, but of the 1,317 units represented 11.3% of total housing damages. Nearly half were manufactured housing units. Glades also had a small number of housing units damaged, but a significant 11.6% of total housing stock was affected

[7] Monroe County had fewer than 10 apartments damaged, so the exact number was not provided in order to protect the privacy of the tenants and owners.

with over 13% in manufactured housing units. Multifamily housing production is a safe and effective means of replacement housing for these types of units. Palm Beach County sustained damages to over 84,000 housing units and 11,715 of those were multifamily. The four of counties had more than 9.4% of housing damages with the greatest being 16.3% in Palm Beach County. This is a testament to the extent of devastation the four hurricanes caused across the state.

Nineteen of 67 Florida counties were given preferences in QAPs in 2005 and 2006. All QAPs examined gave geographic preferences for the Florida Keys, Front Porch Communities and Rural Development each year, but other than 2005 and 2006, no other preferences were stated for specific counties. That means that 48 counties that experienced some effect of the hurricanes were not given any preference. Comerio (1998) points out that the scope of housing losses relative to local conditions may indicate that some areas may not experience losses to the same degree. For instance, Hurricane Ivan damaged fewer numbers of housing units than the other three storms, but had a significant impact on agriculture and forestry. Comerio also found that *"housing and property decisions made within two years of a hurricane or earthquake bear a relationship to the disaster that forced such decisions"* (p. 246). After two years, decisions are governed by market conditions and personal choice (Comerio, 1998). The State of Florida established housing recovery preferences from recommendations made by HWG. The 2005 QAP was a reaction to the devastation of the storms from the previous year and included those counties that experienced the most extensive housing damages. In 2006, FHFC incorporated many HWG recommendations but greater

attention was given to coastal counties regardless of tier. The preferred counties stated in the 2005 and 2006 QAPs were in direct response to the impact that Hurricanes Charley, Jeanne, Frances, and Ivan had on housing damages. Based on the findings of the QAPS, it was assumed developers might propose LIHTC development in locations preferred in the 2005 and 2006 Qualified Action Plans, regardless of risk.

Ultimately, the 2005 QAP showed preferences for eleven counties, seven of which were coastal counties. Four were located inland. In 2006, twelve counties from Tiers I, II, III, and IV were given location preferences. Eight of these were coastal counties. The response in 2005 correlated with large percentages of housing damages overall with the exception of Escambia County. Escambia had a small percentage of housing losses, but the large numbers of housing losses were significant. Polk County had a lower percentage of housing damages.

In 2006, counties in Tiers II, III and IV were added to the QAP along with the five Tier I counties with a large percentage housing units damaged. Tier II, III, and IV counties also had large numbers of damaged housing except for Monroe County, which had fewer than 25 damaged housing units. Monroe County is a coastal county that encompasses land area on the Florida mainland and includes the Florida Keys. HWG recommended Tier II, III and IV to receive priority in sequential order after Tier I. Since the 2005 QAP included all Tier I counties, the 2006 QAP would be expected to include counties from each of the other tiers because of HWG recommendations to address housing needs in these tiers. An additional recommendation from HWG was that preferences for Tier IV counties should be given to those that border Tier I counties. Tier

IV counties preferred in the 2006 QAP did not adjoin Tier I counties and did not experience significant housing damages. One county was small and rural (Monroe) and another was a medium county (Collier). Broward and Miami-Dade are both coastal and heavily populated. Preference for these counties is likely a response to affordable housing needs within the Tier IV counties rather than a reaction to the effect of the hurricanes since both counties had less than 1% of housing units damaged compared to the state total. Each year, the public agency indicated a preference for coastal counties above inland counties. Rising coastal population is an indicator of affordable housing needs and likely influenced preferences. A thorough analysis of population, income and housing trends would provide a better indication of housing needs for Florida counties that could further explain the preferences of the public agency established in the 2005 and 2006 QAPs.

PHASE II: STATED PREFERENCES OF LIHTC DEVELOPERS

A random sample was drawn from the LIHTC database and participants were contacted by telephone or email prior to implementation of the survey. A total of 112 participants were emailed a link to the survey and were given a four week time frame to complete the questionnaire (Table 5-4). Reminders were emailed after week one and week three, and again two days before the deadline. Two participants opened the survey and opted out and 29 participants completed the survey for a response rate of 28%.

Table 5-4: Survey Responses

Sample Population	Respondents	Response Rate
n=112	31	28%

Survey Results

Response to closed-ended survey questions were analyzed using descriptive and inferential statistics. An open ended question was also included. This section discusses the results. The survey instrument is found in the appendix.

Business Model and Experience

The first four questions gave an overview of the general demographics and experience of respondents. LIHTC is a complex program, and professionals with experience are more likely to fully understand the nature of development under the program. Experienced LIHTC respondents are also likely to be more aware of the barriers imposed by the program during disaster recovery. The industry is composed of for-profit and non-profit participants. For-profit developers dominate the LIHTC industry by more than sixty percent nationally and eighty-seven percent in Florida. The Internal Revenue Service (IRS) has provided informal, nonbinding guidance for non-profits who wish to participate in the LIHTC program (Mittereder, 2013). The state, however, often includes preferences in the QAPs for developers who work with non-profit organizations. Survey respondents averaged 17 years of experience in the LIHTC industry. Six respondents were employed in the industry for six years or less. Private, for-profit industries were represented by 66% of respondents and 34% were non-profit organizations (Figure 5-3). Of the non-profits represented, 28% were 501(c)3

organizations. Sixty percent of non-profits were Community Development Corporations (CDC). A CDC is a nonprofit, community-based organization that focuses on a number of initiatives promoting community development, including affordable housing. CDCs typically support or participate in projects at the local level.

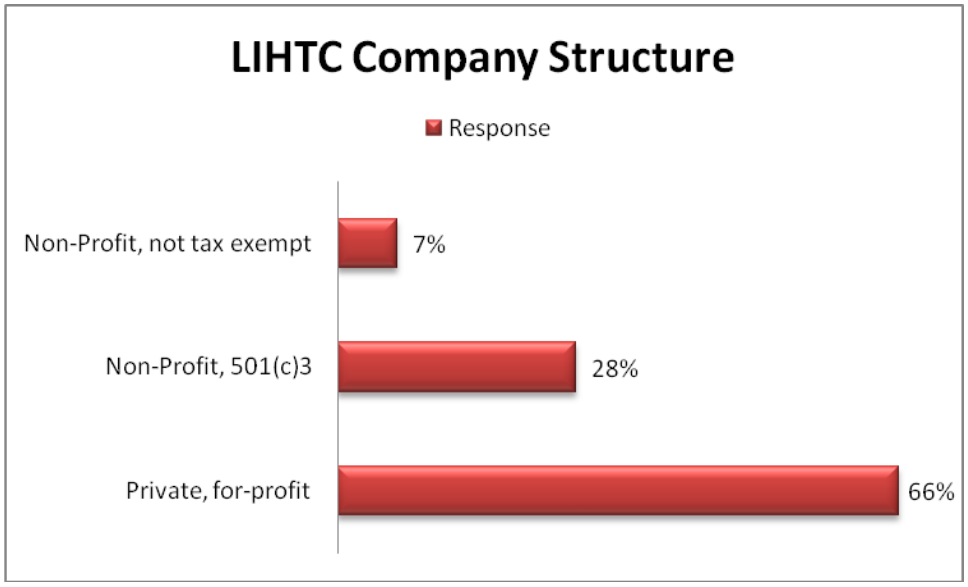

Figure 5-3: Percentage of For-Profit and Non-Profit Firms
n=29

Geographic Experience

Questions 5 through 9 sought to understand the geographic scope of respondent experience and whether experience included other development projects in addition to LIHTC. These questions also asked about respondents experience with coastal development specifically and experience with disasters in the context of LIHTC development. Most respondents, 65.5%, participated in LIHTC development in multiple states. Slightly more than 20% developed LIHTC in a single county, and 13.8% operated

in multiple counties within the state. Over 82% of participants indicated involvement with projects other than LIHTC. The same percentage, 82%, owned LIHTC in coastal counties. More than 39% of respondents had experienced damages to LIHTC units as a result of a hurricane, and of those, all of them had more than 20 units damaged as a result. This study was not specifically interested in the numbers of units damaged as a result of a hurricane but was interested in the preferences associated with development. It is obvious from the number of respondents selecting the highest category available for damaged units that in future surveys, twenty units or above should be in the lower range of categories for understanding the extent of damages.

Ranking Preferences

The next few questions asked respondents to rank a series of preferences. The first question asked respondents to rank the importance of five general categories of risk discussed in Chapter 2. Risk categories were identified in the development literature and included risk variables like credit, debt burdens, interest rates, policy, funding, and hazards. These variables were categorized based on a modified STEEP analysis for real estate development built from the work of Khumpaisal and Ross (2007) and Morrison (2007). The categories were social, technical, economic, environmental, and government (Figure 5-4). Social factors included public sentiment and advocacy. Environmental factors included proximity to the coast, impact areas, and events related to hurricanes. Both of these categories had the least influence on development decisions. The technical categories most significant to development include financial factors associated with real estate development, including cap rates, internal rates of return, and

other project oriented factors. Economics included externalities that included government funding and land acquisition. Government priorities were a function of program changes associated with political change and volatility.

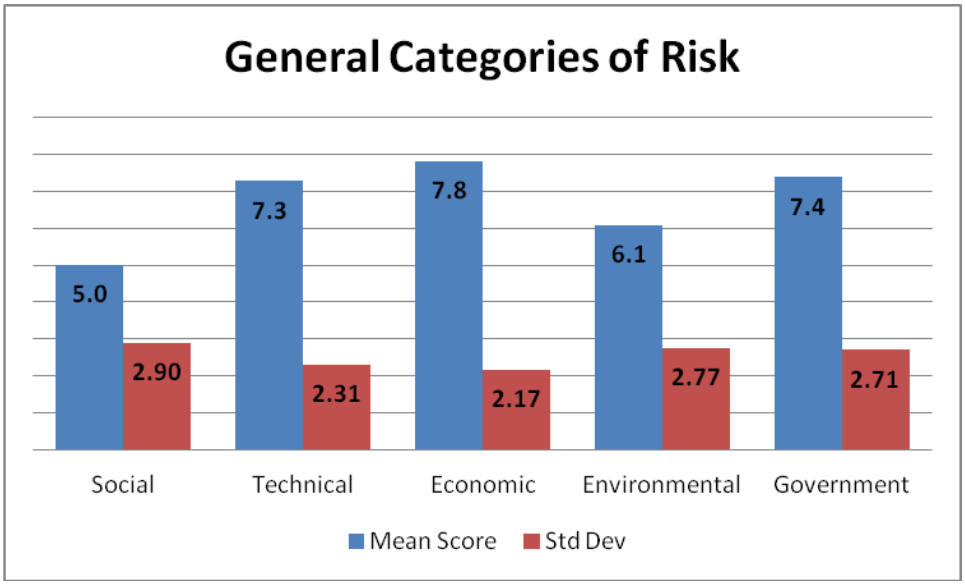

Figure 5-4: Risk Categories

Respondents were asked to rank each category from 0 to 10, with 0 indicating low risk and 10 indicating high risk. Technical, economic, and government categories each scored above seven. Economic factors presented the greatest risks that were most likely to derail an affordable housing project. These elements included sources needed to fund development. Social factors, such as the level of community support for development, were least likely to influence the decision to develop. All categories scored greater than neutral significance for influencing a development decision except the Social category.

Development decisions were most influenced by economic forces, government and political influences, and the technical requirements needed for project profitability.

Funding Preferences

Government funding was the primary factor in the economic category. Funding from government sources is often essential for feasibility of affordable housing production. Developers rely on funding assistance during the recovery and redevelopment phase of disaster because of the limitations and constraints on rent increases. The LIHTC database revealed very little about project funding. Most of the fields for HOME and CDBG funds were blank. Only five percent of projects in the database received HOME funding and even fewer, no more than one percent, included CDBG funds (Table 5-5). The data means little considering that nearly 80% of LIHTC fields for two programs were blank. Tax exempt bonds, typically state sponsored disaster bond programs such as Liberty Bonds, or Go Zone, were used in 31% of Florida LIHTC with only 21% of fields being reported as blank. Future research regarding the efficacy of subsidies is contingent on accuracy and completeness of fields within the LITHC database.

Table 5-5: Analysis of CDBG and HOME Programs in Existing LIHTC

LIHTC Database Analysis - 1987 to 2012				
	United States		Florida	
		Ratio		Ratio
Total LIHTC Developments	17,047		459	
Total LIHTC Units/Avg Per Project	1,098,605	64.45	148,287	323.07
Non-Profit	***Developments***	***% of Total***	***Developments***	***% of Total***
Yes	2973	17%	59	13%
No	10557	62%	400	87%
Blank	3518	21%	0	0%
HOME		**$ 855,302,105**		**$ 18,869,100**
Yes	1231	7%	24	5%
No	7111	42%	83	18%
Blank	8705	51%	352	77%
CDBG		**$ 131,330,414**		**$ 2,130,691**
Yes	337	2%	4	1%
No	7448	44%	82	18%
Blank	9262	54%	373	81%
***Tax Exempt Bonds**				
Yes	2136	13%	143	31%
No	12576	74%	219	48%
Blank	2335	14%	97	21%
*** The value of Tax Exempt bonds was unreported in the LIHTC database and is not analyzed.**				

Source: HUD

The survey ranked thirteen funding programs used for development during disaster recovery (Figure 5-5). Respondents were also asked to consider the importance of incentives given to develop in an impact zone, which is an area directly hit by a hurricane. Impact zones often withstand the greatest degree of physical damage. The HWG report grouped counties that were in the impact zone of one or more hurricanes in the Tier I group.

Supplemental LIHTC was most preferred program for development in an impact zone. Supplemental LIHTC ranked 6.2 on a scale of 1 to 7 with a standard deviation of 0.88, indicating the program was the most significant for mitigated risk among respondents. The HOME program is often used in conjunction with LIHTC and has many of the same restrictions. HOME funds were the second most important funding source according the respondents. Loan programs of all types were predictably less attractive. Federal disaster loans outranked traditional financing, likely because of traditionally lower interest rates for this type of funding. Grants were the next category of funding preferences with Community Development Block Grants (CDBG) outweighing Federal Disaster Grants. Mitigation Grants were the least preferred in the Grant category. Other funding options that were not included in funding options were contributed by one or more respondents. These included state housing trust funds, forgivable debt, and Project Based Section 8 Rental Assistance, a voucher program that allows tenants to locate housing from private owners in the market, including LIHTC.

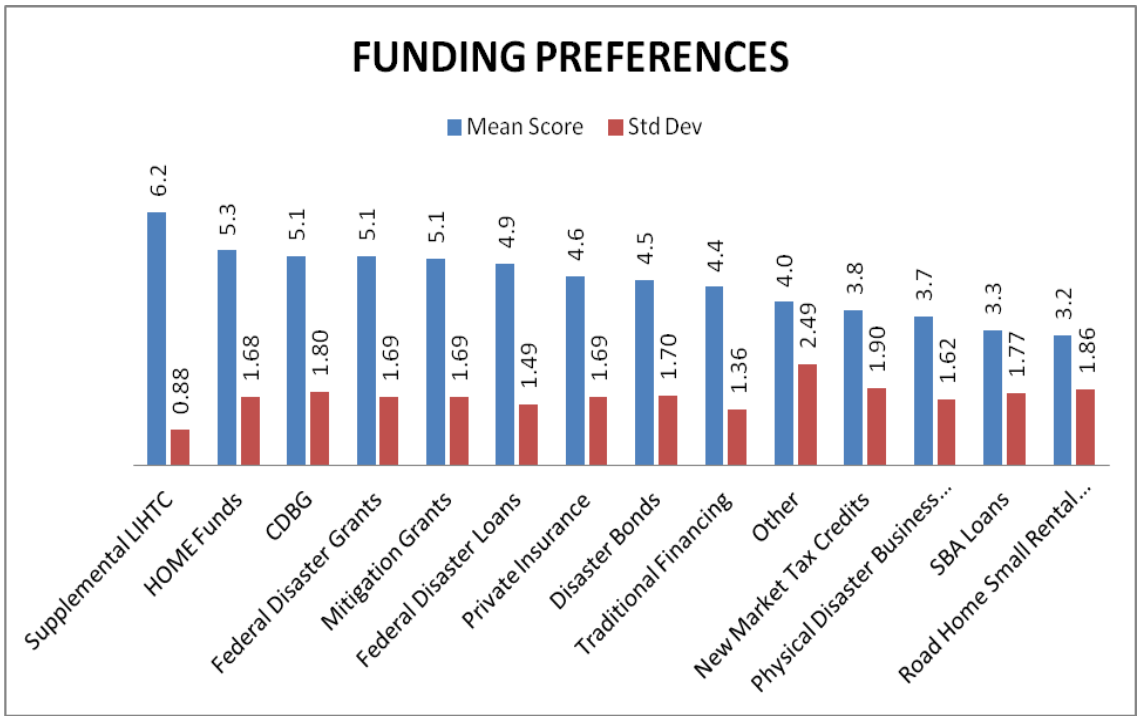

Figure 5-5: LIHTC Preferred Funding Preferences

Respondents were also asked to rank programs from 0 to 10 that are critical for participation in the LIHTC program during disaster recovery with 0 being not critical, indicating that the program does not mitigate developer risk. A score of ten indicates that the program is critical for addressing risk when development decisions are made. As in the previous question, Supplemental LIHTC was the most favored response with a mean score of 7.63 (Figure 5-6). This was followed by HOME funds and Federal Disaster Grants. Funding sources that added debt fell below the median indicating a high risk. State Housing Trust Funds and Project Based Section 8 Rental Assistance were included in the "other" category.

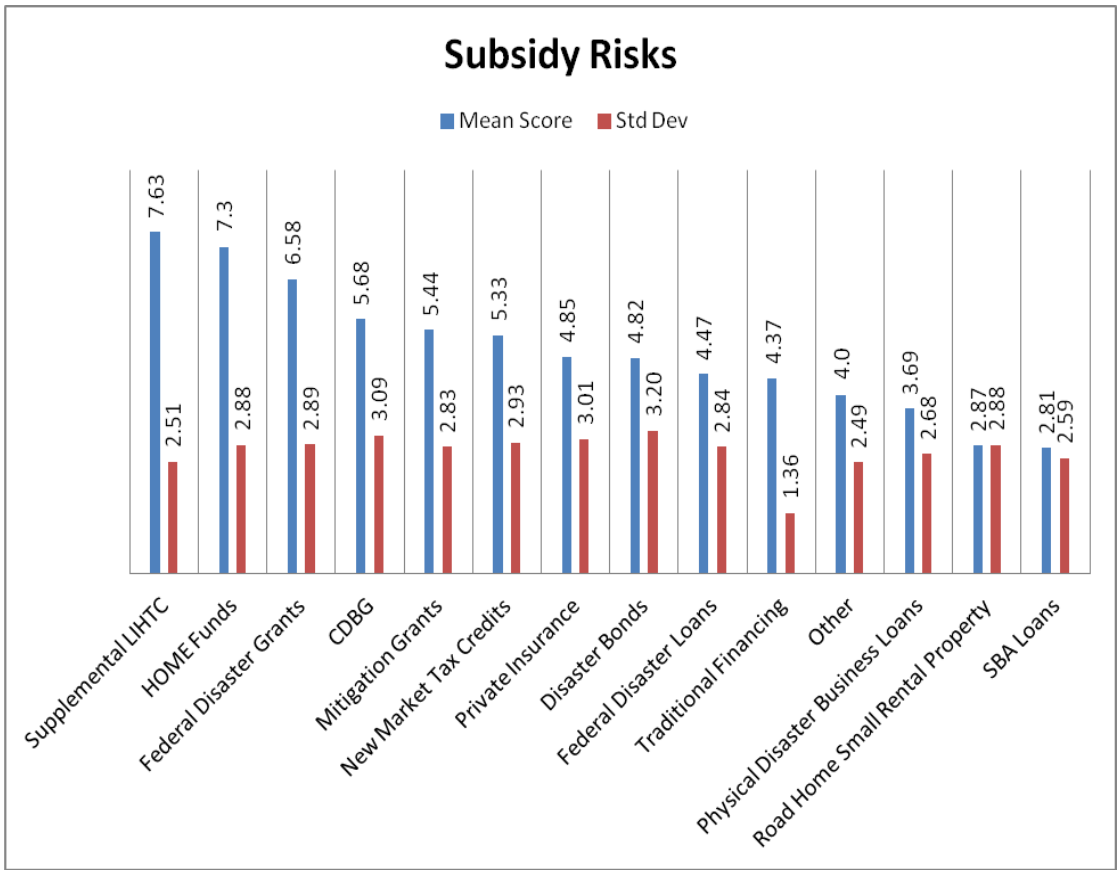

Figure 5-6: Identifying LIHTC Subsidy Risks

Location Preferences

Respondents were asked to rank preferences specifically in terms of location. This section also asked respondents to rank non-financial incentives that influenced development decision-making. Respondents were given twelve potential location characteristics or potential hazards related to a site. Responses were ranked on a sliding scale with 0 being the most preferred, meaning less risk, to 10 being the least preferred, or the greatest risk (Figure 5-7). The least preferred site, ranking below 3.6, had some

potential for storm surge damage during a hurricane. The most preferred site with the least risk was located more than 25 miles from the coast.

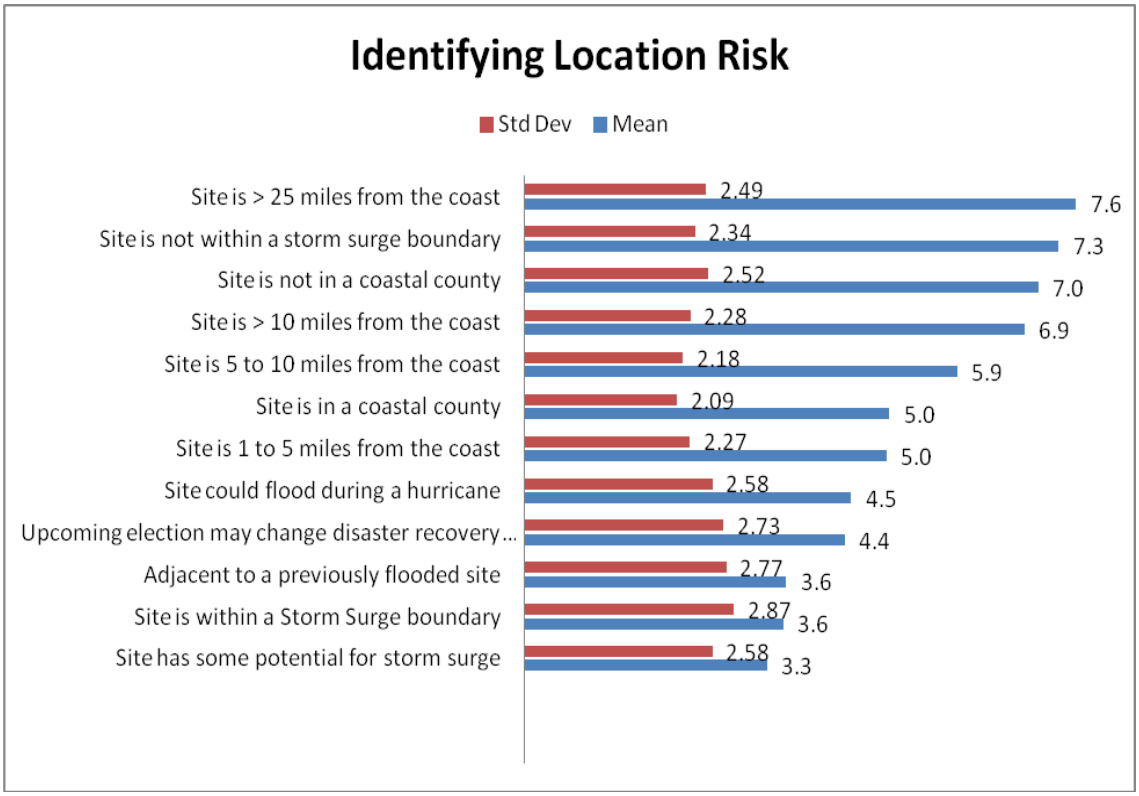

Figure 5-7: Location Risks

Respondents were also asked to rank political and social influences on development decisions. These influences are considered externalities over which LIHTC producers have no control. Respondents stated a willingness to participate in development if land costs were lower and if support from advocacy groups were favorable for a specific community. Higher land costs and more regulations would have a negative influence on a willingness to participate more than lack of local support. High insurance costs were as risky to development activity as rising construction costs and

higher land costs. These three factors could negatively affect profitability. Other than Supplemental Tax Credits and favorable financing, the most significant factors reducing risk for LIHTC development during disaster recovery were found in six areas: disaster relief programs, lower land costs, advocacy in favor, lower insurance costs, more incentives to build in coastal areas, and flexible regulations (Figure 5-8). Incentives to build in coastal areas could arguably increase risk without attention to site location during the pre-development phase. The most significant barriers for development after unfavorable financing were high costs for insurance, construction, and land as well as regulations and public sentiment against an affordable housing project.

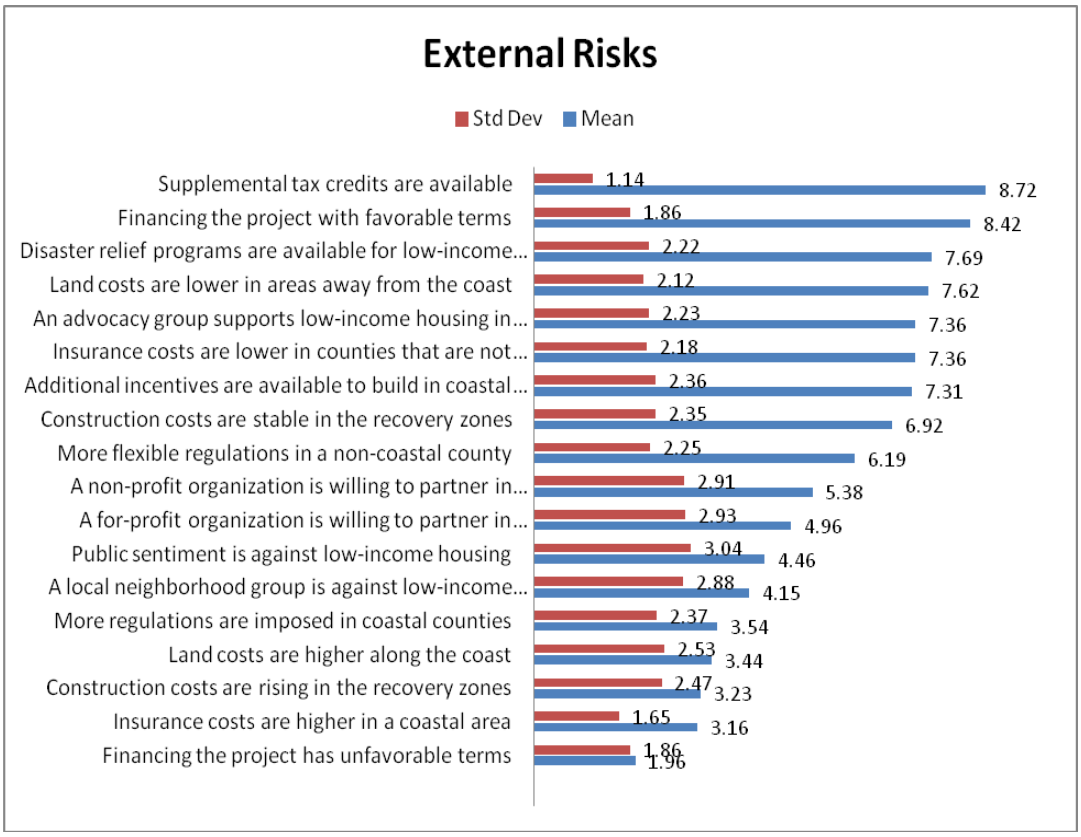

Figure 5-8: Measuring Risks from Externalities

Statistical Analysis

Funding preferences and location preferences were further analyzed using statistical analysis. As stated earlier, an impact zone is an area that withstands the greatest degree of physical damage, and in the case of coastal hurricanes, is most likely to be in a coastal county. The statistical analysis conducted for this study did not indicate causality, but there was correlation between some variables.

Phase I revealed that the public agency, or housing authorities, had a preference for coastal areas subject to hurricane impact or to areas directly hit by one or more of four hurricanes in 2004. Descriptive statistical analysis revealed that Supplemental LIHTC was the most preferred funding program when compared to the mean of all other programs. The initial phase of statistical analysis looked at the mean between two groups, the for-profit developer and the non-profit developer. The mean of combined for-profit and non-profit developers was 6.19 on a scale of 1 to 7. Federal Disaster Grants, HOME and CDBG programs were the next highest ranking programs with mean scores of 5.06, 5.06, and 5.10 respectively. On the surface, the results suggest that Supplemental LIHTC is preferred over all other funding sources used in conjunction with LIHTC.

Location risk between the combined for-profit and non-profit groups indicated a preference for site locations greater than 10 miles from the coast. A mean score of 7.6 among respondents show a greater preference for sites more than 25 miles from the coast. Respondents had a mean score of 7.3 for sites not within a storm surge boundary. A site not in a coastal county had a mean score of 7.0. In contrast, the least preferred sites, with

mean score of between 3.3 and 3.6, included sites with some potential for storm surge, sites within storm surge boundaries, and sites adjacent to previously flooded sites.

Two Independent Samples T-Test

To assess the difference between preferences of for-profit and non-profit LIHTC developers, an independent two-tailed *t*-test was conducted using the company structure (non-profit and for-profit) as the independent variables and the funding programs as dependent variables. A test for homogeneity of variances between the two groups was conducted for each funding source. The hypothesis assumes that variances are not significantly different regardless of business structure (for-profit vs. non-profit). Using the probability level of *.05,* if the Sig value for Levene's test is < *.05,* the conclusion is that the variances were significantly different and the t-test is invalid. If Levene's was > *.05*, variances are not significantly different and the t-test is valid. Levene's test for equality was not violated for any of the variables with one exception. HOME funding had a significance of *0.044* (See Table 5-6). The differences between the mean for the regular *(0.287)* and adjusted t-test *(0.172)* was minimal.

Table 5-6: T-test of Means by Group for Funding Preferences
Means and Standard Deviations of Dependent Variables by Group

	Group					
	For Profit (n = 21)		Non-Profit (n = 10)			
Variable	*M*	*SD*	*M*	*SD*	*t*(29)	*Two-tailed Adj. (Sig)*
CDBG	5.00	2.000	5.30	1.252	.433	< .668
HOME	4.81	2.064	5.60	1.075	1.401	< .172
Suppl LIHTC	6.38	0.805	5.60	1.075	-2.041	< .031*
Disaster Bonds	4.67	1.798	3.67	1.581	-1.443	< .160
Mitigation Grants	5.24	1.814	4.50	1.581	-1.101	< .280
Federal Disaster Loans	4.86	1.711	4.80	1.317	-.093	< .927
SBA Loans	3.10	1.921	3.40	1.265	.455	< .653
Traditional Financing	4.62	1.431	4.00	1.155	-1.192	< .243
Physical Disaster Business Loan	3.81	1.662	3.22	1.481	-.914	<.368
Federal Disaster Grant	5.05	1.830	5.10	1.729	.076	<.940
Private Insurance	4.71	1.707	4.50	1.841	-.319	<.752
Road Home Small Rental	2.76	1.947	3.70	1.829	1.278	<.212
New Market Tax Credits	3.52	1.940	4.40	1.713	1.218	<.233

Note. n = sample size within group.

This test was repeated to assess the difference between for-profit and non-profit LIHTC developers for location preferences. Levene's test for equality was not violated for any of the variables indicating no statistical difference in the variances between the two groups (Table 5-7).

Table 5-7: T-test of Means by Group for Location Preferences
Means and Standard Deviations of Dependent Variables by Group

	Group					
	For Profit (n = 16)		Non-Profit (n = 8)			
Variable	*M*	*SD*	*M*	*SD*	*t*(24)	*Two-tailed Adj. (Sig)*
In a coastal county	4.93	1.87	5.14	2.67	0.214	< .833
Not in a coastal county	7.17	2.27	6.77	3.07	-0.377	< .710
Within a storm surge boundary	3.43	2.85	3.83	3.19	0.281	< .781
Not within a storm surge boundary	7.53	1.87	6.87	3.23	-0.644	< .526
Site is subject to flooding	4.82	2.60	3.75	2.55	-0.968	< .343
Potential for storm surge damage	3.50	2.68	3.00	2.50	-0.439	< .665

Correlation Coefficient

Pearson's Correlation was calculated to determine if there was a linear relationship between the thirteen funding variables. P-values < .05 indicate some kind of relationship between programs. Some correlation exists between both loan and grant programs associated with disaster with significance at the .01 level and the .05 level, indicating some relationship between funding types. According to Tabachnick and Fidell (2007), the correlation matrix should be examined for correlation coefficients greater than 0.30. There were 27 pairs of variables with correlations between .30 and .763 indicating high correlations between variables (Table 5-8).

Table 5-8: Correlation Coefficient between Funding Subsidies

		CDBG	HOME	SUPP LIHTC	DISASTER BONDS	MITIGATION GRANTS	FEDERAL DISASTER LOANS	SBA LOANS	TRAD FINANCE	PHY DISASTER LOAN	FED DISASTER GRANT	PRIVATE INSURANCE	ROAD HOME SMALL RENTAL	NMTC
CDBG	Pearson Correlation	1												
	Sig (2-tailed)													
	N	31												
HOME	Pearson Correlation	0.193	1											
	Sig (2-tailed)	0.297												
	N	31	31											
SUPPL LIHTC	Pearson Correlation	0.384	0.262	1										
	Sig (2-tailed)	0.033	0.154											
	N	31	31	31										
DISASTER BONDS	Pearson Correlation	-0.351	0.139	-0.120	1									
	Sig (2-tailed)	0.057	0.463	0.529										
	N	30	30	30	30									
MITIGATION GRANTS	Pearson Correlation	-0.214	0.323	-0.08	**0.645****	1								
	Sig (2-tailed)	247	0.076	0.671	0.000									
	N	31	31	31	30	31								
FEDERAL DISASTER LOANS	Pearson Correlation	-0.352	*0.387**	-0.074	**0.668****	**0.763****	1							
	Sig (2-tailed)	0.052	0.031	0.691	0.000	0.000								
	N	31	31	31	30	31	31							
SBA LOANS	Pearson Correlation	-0.104	0.198	-0.157	*0.392**	0.166	*0.357**	1						
	Sig (2-tailed)	0.576	0.287	0.398	0.032	0.372	0.049							
	N	31	31	31	30	31	31	31						
TRAD FINANCE	Pearson Correlation	0.203	-0.199	0.187	-0.006	-0.042	-0.170	0.249	1					
	Sig (2-tailed)	0.273	0.283	0.313	0.976	0.823	0.361	0.177						
	N	31	31	31	30	31	31	31	31					
PHYSICAL DISASTER LOAN	Pearson Correlation	-0.257	0.240	-0.207	**0.545****	**0.470****	**0.552****	**0.718****	0.270	1				
	Sig (2-tailed)	0.17	0.202	0.272	**0.002**	**0.009**	**0.002**	**0.000**	0.148					
	N	30	30	30	30	30	30	30	30	30				
FEDERAL DISASTER GRANT	Pearson Correlation	-0.076	0.360	-0.005	**0.529****	**0.581****	**0.723****	*.357**	-0.136	**0.543****	1			
	Sig (2-tailed)	0.683	0.047	0.978	**0.003**	**0.001**	**0.000**	0.049	0.465	0.002				
	N	31	31	31	30	31	31	31	31	30	31			
PRIVATE INSURANCE	Pearson Correlation	0.208	-0.056	0.332	-0.083	-0.166	-0.083	0.260	0.293	0.066	-0.058	1		
	Sig (2-tailed)	0.263	0.764	0.068	0.663	0.373	0.656	0.158	0.110	0.728	0.757			
	N	31	31	31	30	31	31	31	31	30	31	31		
ROAD HOME	Pearson Correlation	-0.089	0.16	*-0.383**	*0.448**	0.118	*0.421**	**0.748****	0.230	**0.679****	*.389**	0.207	1	
	Sig (2-tailed)	0.633	0.391	0.033	0.013	0.526	0.018	**0.000**	0.212	**0.000**	0.031	0.263		
	N	31	31	31	30	31	31	31	31	30	31	31	31	
NMTC	Pearson Correlation	0.065	0.246	-0.281	0.321	0.151	*0.382**	**0.710****	0.175	**0.653****	**0.513****	0.081	**0.671****	1
	Sig (2-tailed)	0.727	0.183	0.126	0.083	0.417	0.034	**0.000**	0.345	**0.000**	**0.003**	0.666	**0.000**	
	N	31	31	31	30	31	31	31	31	30	31	31	31	31

* Correlation is signficant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

Correlations are significant at the 0.01 level between the various disaster programs. As preferences for Disaster Bonds increases, preferences for Federal Disaster Grants, Physical Disaster Loans, and Mitigation Grants increases. Supplemental LIHTC is significant at the .05 level with Community Development Block Grants (CDBG). Developers who prefer CDBG also preferred Supplemental LIHTC. CDBG is often used in conjunction with LIHTC. Developers often use multiple subsidies to fund LIHTC development. During disaster recovery, developers will combine available disaster related programs to fund new development or to rehabilitate damaged units.

Pearson's Correlation was also calculated to determine if there was a linear relationship between six location preferences. P-values < .05 indicate some kind of relationship between programs. The results indicate that correlation exists between locations with significance at the .01 level. There were 11 pairs of variables with correlations between .545 and .714 indicating a high correlation between location variables (Table 5-9). There was a significant positive correlation (.703) between a site located in a coastal county and a site located in a non-coastal county. These opposing variables would be expected to have a negative correlation, meaning when preferences for coastal counties increases, preferences for non-coastal counties decrease. However this was not the case. The results suggest that sites in coastal counties positively correlate with sites in non-coastal counties. One explanation could be that the wording of statement choices could have resulted in confusion among the respondents. The question intentionally had elements of contrast that could have created confusion in the interpretation of results. For instance, a response choice stating a preferred site would be in a storm surge boundary was followed by a response choice stating a preferred site was not in a storm surge boundary. Predictably, flooding and damages from storm surge were not significantly correlated with sites not located within storm surge boundaries.

The findings do suggest that location in coastal counties and inland counties is highly correlated with the perception of risk associated with storm surge and flooding hazards as opposed to strictly being in a coastal county or not highlighting an awareness of risk associated with proximity to flooding and storm surge events, particularly when adjacent sites have experienced damages from these hazards. High positive correlations

between sites within a storm surge boundary, flooding or with potential for storm surge damages reflect the risk of proximity to previous flooding or storm surge events.

Table 5-9: Correlation Coefficient between Location Preferences

Location Preferences		In a Coastal County	Not in a Coastal County	In a Storm Surge Boundary	Not in a Storm Surge Boundary	Potential for flooding	Potential for Storm Surge damages
In a Coastal County	Pearson Correlation	1					
	Sig. (2-tailed)						
	N	22					
Not in a Coastal County	Pearson Correlation	.703**	1				
	Sig. (2-tailed)	0.000					
	N	22	26				
In a Storm Surge Boundary	Pearson Correlation	.706**	0.42	1			
	Sig. (2-tailed)	0.000	0.052				
	N	21	22	22			
Not in a Storm Surge Boundary	Pearson Correlation	.601**	.639**	0.098	1		
	Sig. (2-tailed)	0.004	0.001	0.673			
	N	21	24	21	25		
Potential for Flooding	Pearson Correlation	.707**	.668**	.611**	0.339	1	
	Sig. (2-tailed)	0.000	0.000	0.003	0.098		
	N	21	24	21	25	25	
Potential for Storm Surge damges	Pearson Correlation	.714**	.545**	.667*	0.380	.583**	1
	Sig. (2-tailed)	0	0.006	0.001	0.067	0.003	
	N	21	24	21	24	24	24

** Correlation is significant at the 0.01 level (2-tailed)

Respondents were also asked to what degree a series of hypothetical situations would inhibit their willingness to participate in disaster recovery. Pearson's Correlation was calculated to determine linear correlations between these statements resulting in a high correlation of 30 pairs of variables with significance at the .01 level (Table 5-10). Additional incentives had a high correlation with disaster recovery programs and higher construction costs associated with redevelopment. Developers facing new or reconstruction during recovery efforts would likely seek out additional subsidies

available for participation in an effort to reduce financing costs. The impact of public sentiment against a LIHTC development is highly correlated unfavorable financing, stricter regulations, and high insurance costs suggesting these higher costs coupled with negative public sentiment could impact development decisions. Correlations are not an indication of causality, but could suggest some of the relationships that have the greatest impact on development decisions during disaster recovery[8].

[8] Cross tabulations is another way of analyzing relationships between two or more variables. The pilot study analyzed a survey among real estate students and LIHTC stakeholders using this method. Crosstabs developed during the pilot were analyzed at the county level in relation to storm surge and flood zone. The final survey was more comprehensive and asked respondents as series of questions relating to preferences for subsidies and development decision-making. Cross tabulations were extracted with data that included funding and location variables on either a 7-point Likert scale or a 10-point sliding scale. For each data set the expected cell count was <5 signaling that the statistic was not valid. For instance, crosstabs on funding preferences and location by company type (for-profit/non-profit) resulted in 18 cells that had expected counts that are <5 indicating no relationship between non-profit and for-profit groups.

Table 5-10: Correlation Coefficient for Development Participation

With all else being equal, to what degree would each of the following statements affect your willingess to participate in disaster recovery efforts ...

		Public sentiment is against low-income housing	More regulations are imposed in coastal counties	Insurance costs are higher in coastal areas	Financing the project has unfavorable terms	Construction costs are rising in recovery zones	Land costs are higher along the coast	Insurance costs are lower in counties that are along the coast	Financing the project with favorable terms	Land costs are lower in areas away from the coast	Construction costs are stable in the recovery zones	Disaster relief programs are available for low-income multifamily housing	Supplemental tax credits are available	A non-profit organization is willing to partner with us in development the project	A for-profit organization is willing to partner with us in development the project	A local neighborhood group is against low-income housing	Additional incentives are available to build in coastal counties
Public sentiment is against low-income housing	Pearson Correlation	1															
	Sig (2-tailed)																
	N	26															
More regulations are imposed in coastal counties	Pearson Correlation	.520**	1														
	Sig (2-tailed)	0.006															
	N	26	26														
Insurance costs are higher in coastal areas	Pearson Correlation	.532**	.543**	1													
	Sig (2-tailed)	0.006	0.005														
	N	25	25	25													
Financing the project has unfavorable terms	Pearson Correlation	.510**	.417*	.559**	1												
	Sig (2-tailed)	0.009	0.038	0.004													
	N	25	25	25	25												
Construction costs are rising in recovery zones	Pearson Correlation	0.225	.593**	.466*	0.310	1											
	Sig (2-tailed)	0.269	0.001	0.019	0.131												
	N	26	26	25	25	26											
Land costs are higher along the coast	Pearson Correlation	.521**	.435*	.471*	.623**	.607**	1										
	Sig (2-tailed)	0.008	0.03	0.018	0.001	0.001											
	N	25	25	25	25	25	25										
Insurance costs are lower in counties that are along the coast	Pearson Correlation	0.146	0.256	0.222	0.246	0.337	0.123	1									
	Sig (2-tailed)	0.487	0.216	0.296	0.247	0.100	0.568										
	N	25	25	24	24	25	24	25									
Financing the project with favorable terms	Pearson Correlation	.432*	0.291	.440*	0.244	0.335	0.388	.643**	1								
	Sig (2-tailed)	0.028	0.149	0.028	0.239	0.094	0.056	0.001									
	N	26	26	25	25	26	25	25	26								
Land costs are lower in areas away from the coast	Pearson Correlation	0.159	0.131	0.315	0.288	0.209	0.129	.876**	.673**	1							
	Sig (2-tailed)	0.437	0.525	0.125	0.162	0.306	0.538	0.000	0.000								
	N	26	26	25	25	26	25	25	26	26							
Construction costs are stable in the recovery zones	Pearson Correlation	0.151	.482*	0.372	0.15	.500**	0.299	.631**	.503**	.525**	1						
	Sig (2-tailed)	0.461	0.013	0.067	0.475	0.009	0.147	0.001	0.009	0.006							
	N	26	26	25	25	26	25	25	26	26	26						
Disaster relief programs are available for low-income	Pearson Correlation	-0.144	0.374	0.170	-0.181	.560**	0.076	.538**	0.285	0.263	.769**	1					
	Sig (2-tailed)	0.483	0.060	0.416	0.386	0.003	0.717	0.006	0.159	0.195	0.000						
	N	26	26	25	25	26	25	25	26	26	26	26					
Supplemental tax credits are available	Pearson Correlation	-0.017	0.25	0.197	-0.040	.603**	0.235	0.243	.402*	0.292	.496**	.577**	1				
	Sig (2-tailed)	0.936	0.229	0.356	0.853	0.001	0.269	0.253	0.046	0.157	0.012	0.003					
	N	25	25	24	24	25	24	24	25	25	25	25	25				
A non-profit organization is willing to partner with us in	Pearson Correlation	0.160	0.114	0.224	0.388	0.154	0.014	0.338	.412*	.427**	0.121	-0.055	0.238	1			
	Sig (2-tailed)	0.435	0.58	0.281	0.056	0.453	0.946	0.098	0.036	0.03	0.555	0.789	0.253				
	N	26	26	25	25	26	25	25	26	26	26	26	25	26			
A for-profit organization is willing to partner with us to develop	Pearson Correlation	0.060	.498**	0.339	0.352	0.388	0.052	.426*	0.260	0.223	.522**	.415*	0.161	.498**	1		
	Sig (2-tailed)	0.769	0.010	0.098	0.085	0.050	0.806	0.034	0.200	0.274	0.006	0.035	0.441	0.010			
	N	26	26	25	25	26	25	25	26	26	26	26	25	26	26		
A local neighborhood group is against low-income	Pearson Correlation	.577*	.731**	0.357	0.291	.433*	.497*	0.301	0.286	0.167	.493*	0.333	0.311	-0.136	0.200	1	
	Sig (2-tailed)	0.002	0.000	0.080	0.158	0.027	0.012	0.144	0.156	0.414	0.011	0.097	0.130	0.508	0.328		
	N	26	26	25	25	26	25	25	26	26	26	26	25	26	26	26	
Additional incentives are available to build in coastal counties	Pearson Correlation	-0.272	0.276	0.06	0.133	.625**	0.153	0.16	-0.004	-0.007	.401*	.552**	.456*	0.04	.475*	0.234	1
	Sig (2-tailed)	0.180	0.172	0.776	0.526	0.001	0.464	0.446	0.986	0.971	0.042	0.003	0.022	0.845	0.014	0.250	
	N	26	26	25	25	26	25	25	26	26	26	26	25	26	26	26	26

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

Views from the Experts

Respondents were given an open-ended question that asked why a lack of sufficient units of affordable housing remained a problem after disaster recovery. The question was answered by 23 respondents with responses following eight common themes (Table 5-6). Major themes included: *funding, public sentiment, policy, time, location, risk, tenant barriers,* and *costs*. Each of these categories are explored in greater detail to enhance meaning from the results overall.

Funding

The most common theme among respondents underscored the need for additional funding for affordable multifamily housing production. Specific references were made to low insurance payouts or difficulty working with insurance companies. Six were for additional funding. Specific solutions included grants and forgivable loans. One respondent added:

> *"most existing LIHTC properties have an equity partner and mortgage, both of which are very inflexible when it comes to putting additional debt on their colateral (sic) and the rental income restrictions usually won't support additional debt anyway."*

Another respondent recognized how market dynamics affect costs during disaster recovery stating:

> *"In a disaster recovery, the ability to rebuild affordable housing is solely related to the subsidies provided. Since construction costs are usually*

escalated during a disaster recovery, there is need for even more subsidy than required in a "normal" market."

Policy

Respondents were concerned with the impact of policies on the ability to produce adequate numbers of affordable housing during disaster recovery. Comments suggested that policies should not encourage development in coastal areas.

"Encouraging people to live in disaster-prone areas is not good policy. Encouraging people (all people, not just low income people) to move elsewhere is probably a positive, not a negative."

Another respondent faulted policies that encourage mixed income developments saying:

"Primarily due to the new trend where pure public and or affordable housing is not attractive and can not (sic) be easily financed. The trend is for mixed income communities which drastically reduce the number of pure public; and/or low to moderate income housing."

Others criticized government overreach, the breakdown in the functioning of government, and a lack of understanding of the LITHC program by government officials.

Public sentiment

Respondents suggested that lack of empathy from government and wealthy citizens, who are better connected to the leadership, are a factor in the unwillingness to provide sufficient resources for affordable housing production.

"Government and wealthy families and corporations do not care about low income families and are unwilling to provide the support services needed to help families become self sufficient (sic)."

Others added that public sentiment leans toward personal responsibility and those that live on the coast are at fault because they choose to live in risky areas. One respondent commented:

"This is due in part to public sentiment that people who live in areas prone to damage from natural disasters are partly responsible for their lot because they "chose" to live in a disaster-prone area. This notion, which is false when it comes to affordable housing as choice is limited and families must choose from what is available and typically have to wait quite a while before a unit - any unit - of affordable housing becomes available. Nevertheless, the public sentiment impacts legislators' and local governmental officials' willingness to put the amount of resources needed to fully address the recovery needs."

Location

Comments about location were either mentioned directly or in the context of other themes. One respondent pointed out that those who need affordable housing cannot wait for restoration and recovery and will follow jobs by necessity, while another suggested that units that are available for the dislocated are not in areas that have accessibility to jobs and services.

"If dislocation leads low income households to quality housing in a safer location not a large distance from the original location, disaster recovery can help people move to safer affordable housing."

Still another respondent suggested that people should move to safer areas. Another pointed out the desirability of coastal areas to high income earners and the high land costs associated with coastal development.

Time and Barriers to Occupancy

Developers were concerned with lag time between insurance settlements and the ability to reconstruct damaged properties. Another said that redevelopment takes time, reiterating the interconnectedness of many of the other themes. Still another noted that affordable housing is not available in the market while another said that the poorest could not wait. Tenant barriers to occupancy include long waiting lists, unaffordable rents, and not enough units being built.

"The additional resources contributed by federal, state and local government seldom outweigh the problems created by difficulties with insurance, both existing and new, changes to building/zoning codes, and simply the time involved in the redevelopment process - gaining local government approvals, assembling financing packages, obtaining community support, relocating residents, etc."

Development Costs and Risk

Some respondents explicitly identified risk as a problem impacting affordable housing redevelopment stating:

"Not enough incentives to attract a development company to be willing to take the risk of another disaster or not a cap on potential losses."

Another suggested risk avoidance stating the problem is associated with the "*unwillingness of investors to take greater risks in disaster recovery areas."*

Specific costs perpetuating the problem of insufficient numbers of affordable housing after disaster included high insurance costs, higher operating costs, less profitability, and higher labor and construction costs.

The results from Phase II clearly show that LIHTC developers are aware of the risks associated with coastal locations, particularly in storm surge areas. LIHTC developers receive subsidies in the form of tax credits and other funding sources such as CDBG, HOME funds, and tax bonds among others. The opportunity to reduce debt with these resources and Supplemental LIHTC appealed to the respondents, particularly when coastal development was factored in. The idea that additional subsidies were essential for development along the coast is questionable at best because higher land costs and risk could feasibly be offset by higher rent and property value. It seems counterintuitive that if risk is associated with coastal areas, as repeatedly stated by respondents answering the open-ended question, then additional subsidies should be targeted for risk avoidance.

According to recent studies (Greene, 1992; Comerio et al., 1994; Finch et al., 2010) low-income households face dislocation because there are not enough low-income housing units constructed during disaster recovery. Why do you think this is a problem?

Table 5-11: Common Themes

FUNDING	PUBLIC SENTIMENT	POLICY	TIME	LOCATION	RISK	TENANT BARRIERS	COSTS
Additional funding needed	Personal responsibility-should not live on coast	Should not encourage people to live in disaster prone areas	None available in the market	People should move to safer areas	Risk of loss	Long waiting lists	High insurance costs
Additional resources needed	Personal responsibility	Trends for mixed income development reduce availability	Takes time to redevelop	People go to the jobs	Risk of another disaster	Unaffordable rents	Higher operating costs
Additional funding to cover increased costs	Should not live on coast	Regulatory difficulties	Poorest cannot wait	Available units not accessible to jobs and services	Risk avoidance	Not building enough units	Less profitable
Subsidies needed	Should not live in disaster prone areas	Breakdown of Government function	Lag time between settlement of insurance claims and reconstruction	Coastal areas desirable to high income earners			High labor
Insurance payouts to low	Government does not care about the poor	Government overreach		Higher land costs in coastal areas			High construction costs
Inflexible mortgages reduce ability to add debt	Wealthy do no care about the poor	Not enough affordable housing being built					
Additional subsidies needed	NIMBY	Program restrictions on tenant mix					
Grants		Lack of program understanding by government					
Forgivable Loans		Building code regulations					
Insufficient resources							
Working with insurance companies is difficult							
More incentives needed							
Land costs							
Insurance costs							
Insufficient funding							
Building codes increase costs							
High insurance costs							

PHASE III: PREFERENCES REVEALED WITH GIS

Descriptive statistics were used to determine the number of LIHTC located in the boundaries of storm surge. Storm surge is an abnormal rise of water generated by a storm with the potential to cause extreme flooding, property damage, and death. Storm surge from Hurricane Katrina reached 27.8 feet at Pass Christian, exceeding the previous record set by Hurricane Camille (Fritz et al., 2008). Peak surge often coincides with the landfall of a hurricane but can also occur before or after. In 2005, a post-runner storm surge occurred after Hurricane Wilma struck the southwest coast of Florida. Three years later, the landfall of Hurricane Ike was preceded by a forerunner surge in the 24 hours before the hurricane stuck the Texas coast (Kennedy et al., 2011).

Others have used GIS technology to analyze the storm surge risk of housing in Florida. Since 2011, Core-Logic has completed an annual storm surge analysis of single-family homes exposed to storm surge risk. Researchers used the Sea, Lake and Overland Surges from Hurricanes (SLOSH) model from the National Weather Service (NWS) and National Oceanic and Atmospheric Administration (NOAA) to analyze single family homes on the U.S. coast. The SLOSH model was run using the Maximum of the Maximum of High Water (MOM) data in the storm surge model. According to the most recent findings, more than 6.5 million single-family homes with a reconstruction value of nearly $1.5 trillion are at risk of damage from storm surge in coastal communities (Botts et al., 2014). The study identified Texas and Florida as the states with the greatest risk of damages due to storm surge. Florida ranks number one for the number of homes at risk of storm surge with the potential for 2.5 million homes in harm's way. Botts and

colleagues estimated reconstruction costs for the state at more than $490 billion. A Category 5 hurricane, considered an extreme storm and less likely to occur, was estimated to cause more than $70 billion in damages to single-family homes in the State of Florida alone. Six of the top 15 metropolitan areas at greatest risk of damages from storm surge are located in in the state. Miami, Florida has 562,410 single family homes potentially at storm surge risk for any category of hurricane representing a reconstruction value of $103 billion.

This study used the SLOSH model to identify the number of LIHTC located in the bounds of storm surge from two categories of hurricanes, Category 3 at mean tide (C3M) for an average risk and Category 5 at high tide (C5H) as a worst case scenario. Since 1987, Florida has produced 148,287 LIHTC units in 1,035 developments (Figure 5-9). In Phase III of this study, geographic information systems (GIS) was used to analyze the number of LIHTC located in storm surge, and specifically how LIHTC development was dispersed as a result of the 2004 hurricane season. Identifying LIHTC placed in service during the study period revealed location preferences of developers given the influence of public policy. Phase I analyzed QAPs to determine stated preferences for LIHTC development by the FHFC acting as the public agency. The public agency clearly preferred development in coastal counties. Phase II analyzed the stated preferences of the LIHTC development community. The results indicated that 1) low cost funding was critical for LIHTC development, and 2) developers stated a preference for locations in areas with less risk from the effects of hurricanes. The LIHTC database provides very little funding data so determining the significance of funding resources for this phase

proved impractical. Limited funding data was analyzed and discussed but additional data sources are needed for analysis of risk and preference. This final phase of the study allowed comparisons to be made between stated preferences and revealed preferences for location. Phase III analyzed LIHTC development between 2004 and 2010.

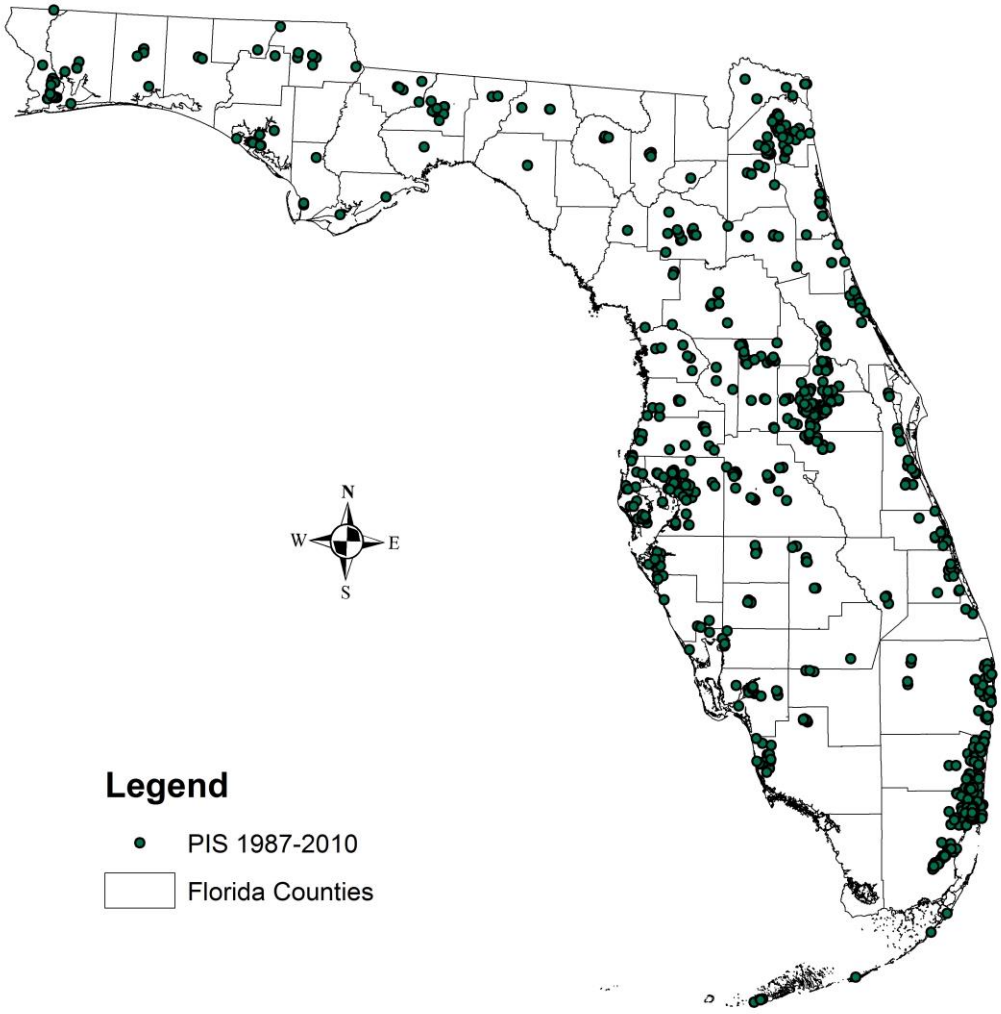

Figure 5-9: LIHTC Developments 1987-2010

In 2003, LIHTC produced 60 affordable housing developments with 13,088 units in Florida. Seventy seven percent of them were located in coastal counties. In 2004, another 60 developments resulted in 11,199 units. In both cases, the majority of units were constructed in coastal communities. The 2003 and 2004 LIHTC served as the baseline of comparison for Phase III of this study.

Coastal LIHTC Development 2004-2010

Since 2003, construction of Florida LIHTC has declined. Intervening forces include the 2004 hurricane season followed by the Great Recession that disrupted the financial markets between 2007 and 2009. The influence of these two events on LIHTC development has not been analyzed. This study is more concerned with the percentage of LIHTC constructed in hazardous areas. Phase III reveals if perceived location risk influences where LIHTC development actually occurs during recovery. Between 2004 and 2010, a total of 44,658 LIHTC units were produced in Florida (Table 5-7). Seventy-four percent were located in coastal counties. Figure 5-10 shows where LIHTC developments were produced during the study period. The greatest number of LIHTC units was placed in service in 2004 and 2005, averaging just over 7,200 units each year. On average, 3,000 units per year were placed in service in coastal counties between 2006 and 2010.

Table 5-12: Coastal and Non-Coastal LIHTC 2004-2010

Baseline	Total LIHTC Developments Placed in Service 2004 - 2010							TOTAL
2003	2004	2005	2006	2007	2008	2009	2010	
60	60	47	36	35	59	52	25	314
	Total LIHTC Units Placed in Service 2004 - 2010							
13088	11199	8677	5380	4842	5765	5534	3261	44658
	LIHTC Developments Placed in Service 2004 - 2010 in Non-Coastal Counties							
15	21	9	16	11	21	9	5	92
	LIHTC Units Placed in Service 2004 - 2010 in Non-Coastal Counties							
2959	3958	1466	2177	1002	1604	956	500	11663
	LIHTC Developments Placed in Service 2004 - 2010 in Coastal Counties							
45	39	38	20	24	38	43	20	222
	LIHTC Units Placed in Service 2004 - 2010 in Coastal Counties							
10129	7241	7211	3203	3840	4161	4578	2761	32995
% Developments in Coastal Counties								
75%	65%	81%	56%	69%	64%	83%	80%	71%
% Units in Coastal Counties								
77%	65%	83%	60%	79%	72%	83%	85%	74%

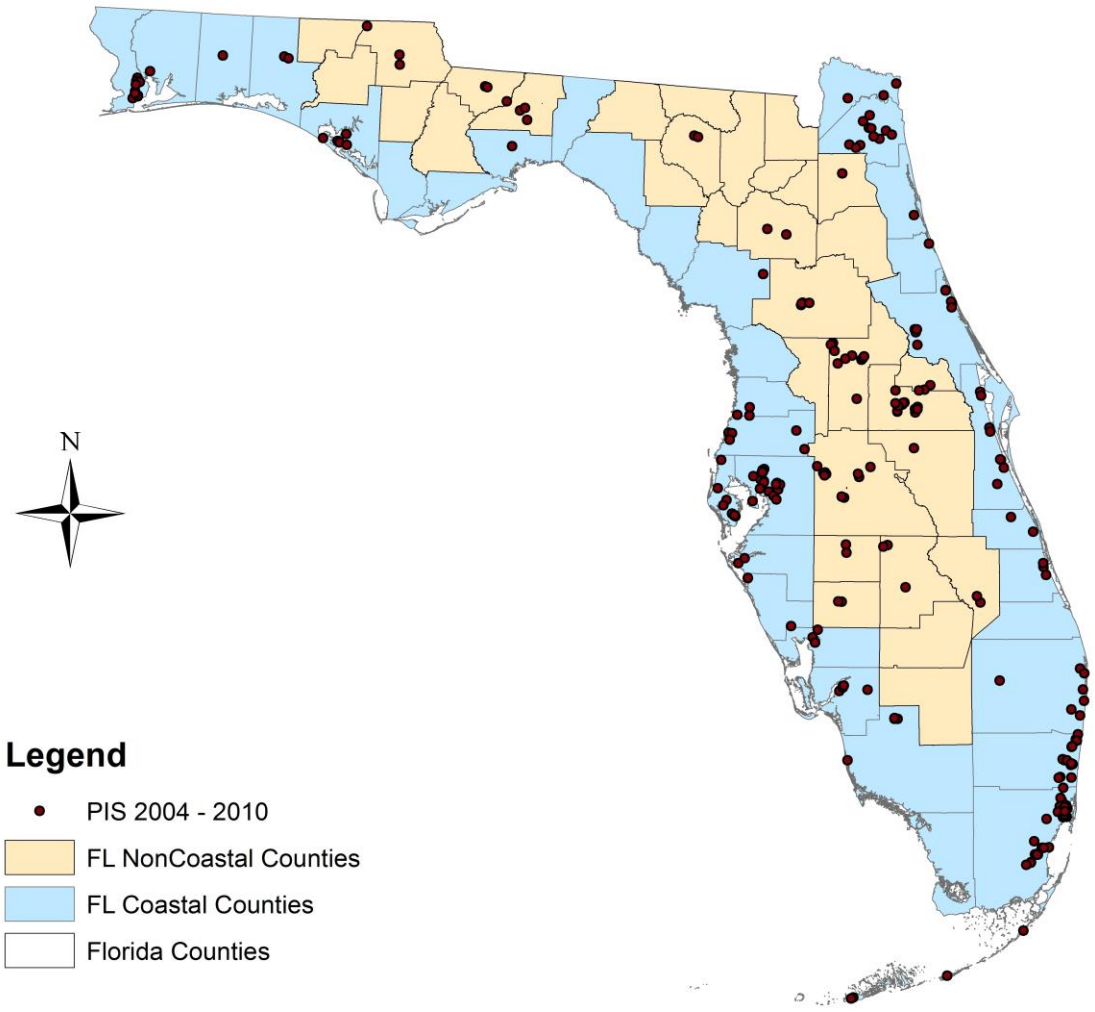

Figure 5-10: LIHTC Developments PIS 2004-2010

In Phase II, developers stated a preference to develop LIHTC away from the coast and hazards associated with storm surge. Coastal population in the U.S. has outpaced inland population growth with the expectation that growth will continue for the foreseeable future (Crowell et al, 2010). The hazards of coastal development are documented in Chapter 1, and Phase II reiterated an understanding of the potential hazards to LIHTC. The discussion of Phase III results begins with an analysis of the total

number of LIHTC in each coastal county compared to the numbers of LIHTC to a C3M and C5H storm surge on the Florida coast.

Florida UTM Zones

The Universal Transverse Mercator (UTM) projection is a two dimensional division of earth's surface into sixty zones. The United States is divided into zones ten through nineteen. Florida is predominantly located in Zone 17 with fifteen of its sixty-seven counties located in Zone 16 (Figure 5-11).

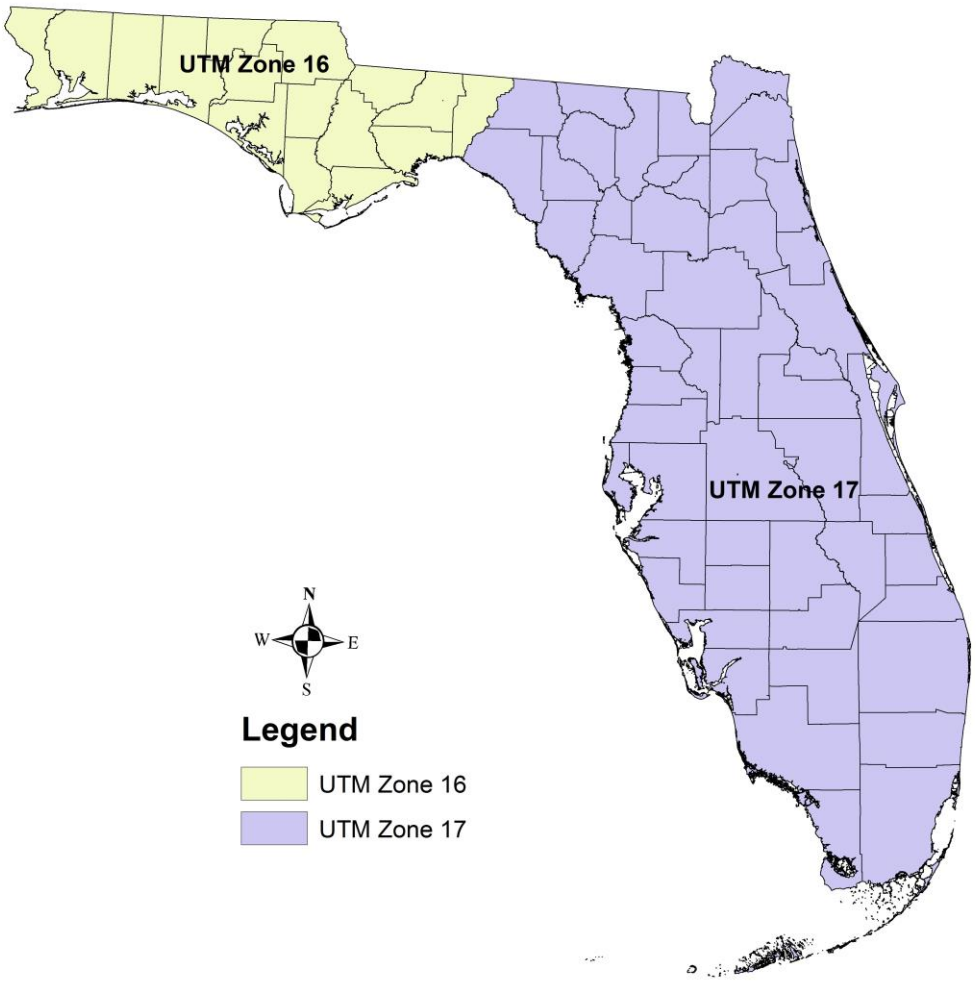

Figure 5-11: Florida UTM Zones

There were 936 LIHTC developments located in UTM Zone 16 with 132,968 units. Eight of these developments were located in storm surge boundaries impacting four counties. Four developments were placed in service between 1987 and 1993, and two were placed in service in 2004. The remaining two developments were placed in service in 2007 and 2011. A total of 805 units placed in service between 1987 and 2011 are located in the boundaries of a C5H storm surge. The minimum storm surge is 12.8 feet to a maximum of more than 19 feet. These eight developments have been incorporated into the overall discussion of findings within UTM Zone 17.

C3M - Category 3 Mean Tide

The greatest percentage of potential losses due to a CM3 storm surge includes four counties recommended for housing production by HWG: Monroe, Charlotte, Collier, and Lee (Table 5-8). Charlotte was a Tier I county included in the 2005 and 2006 QAPs. Charlotte County has 1,481 LIHTC units and potentially faces the loss of 94% of LIHTC housing in the county. Lee County has even more units located in a storm surge area. While only 74% of Lee County LIHTC is located in storm surge, this equates to 2,586 potentially damaged units. Collier and Monroe counties are Tier IV counties. Monroe County has the least number of total units but 98% of the total stock could be potentially damaged from a CM3 storm surge.

The top five counties with the greatest number of LIHTC units in a C3M storm surge area includes four counties preferred in the HWG report and one or both 2005 and 2006 QAPs. Miami-Dade is most at risk with 8,137 units located in a C3M storm surge boundary. Collier County followed with 3,532 units at risk. Hillsborough and Lee

Counties have just over 2,500 LIHTC units in each county subject to damages from a C3M storm surge. Charlotte County is at risk for fewer units, but the 1,399 units at risk are 94% of the total LIHTC stock in the county (Figure 5-13).

A 2014 market update for LIHTC properties suggested that the value of a single LIHTC unit in the Southeast averaged $41,000 per unit (Tax Credit Group, 2014). In 2013, this same reporting agency analyzed the sales of 48 LIHTC properties in the Southeast with a median sales price of $34,700 per unit. Based on this limited analysis, the average of the reported per unit values, or $37,850, was used to conservatively estimate the potential losses from each storm category. A future study could result in a more reliable per unit value for a better estimate of potential damages. For this study, the average value of $37,850 is sufficient to demonstrate risk.

The total value of all Florida LIHTC located within a Category 3 storm surge area is $988 million. Miami-Dade accounts for over 30% of total damages potentially costing the county and industry more than $307 million (Figure 5-14). Three counties represented in HWG tiers and the 2005/2006 QAPs have no units at risk in a C3M storm surge. These counties are Brevard, Escambia, and Santa Rosa. Combined, these three coastal counties have 4,504 LIHTC units.

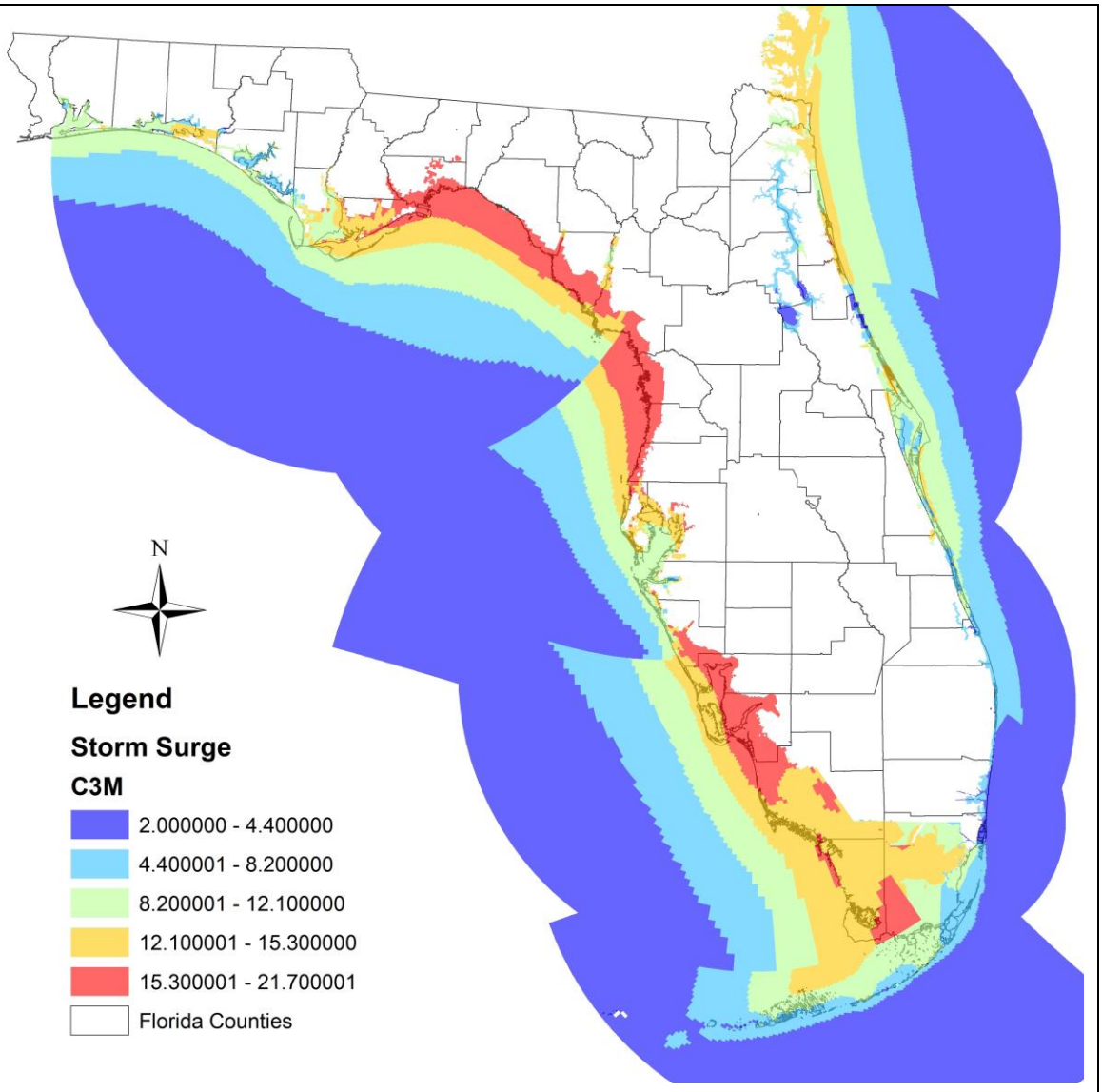

Figure 5-12: Category 3 Storm Surge

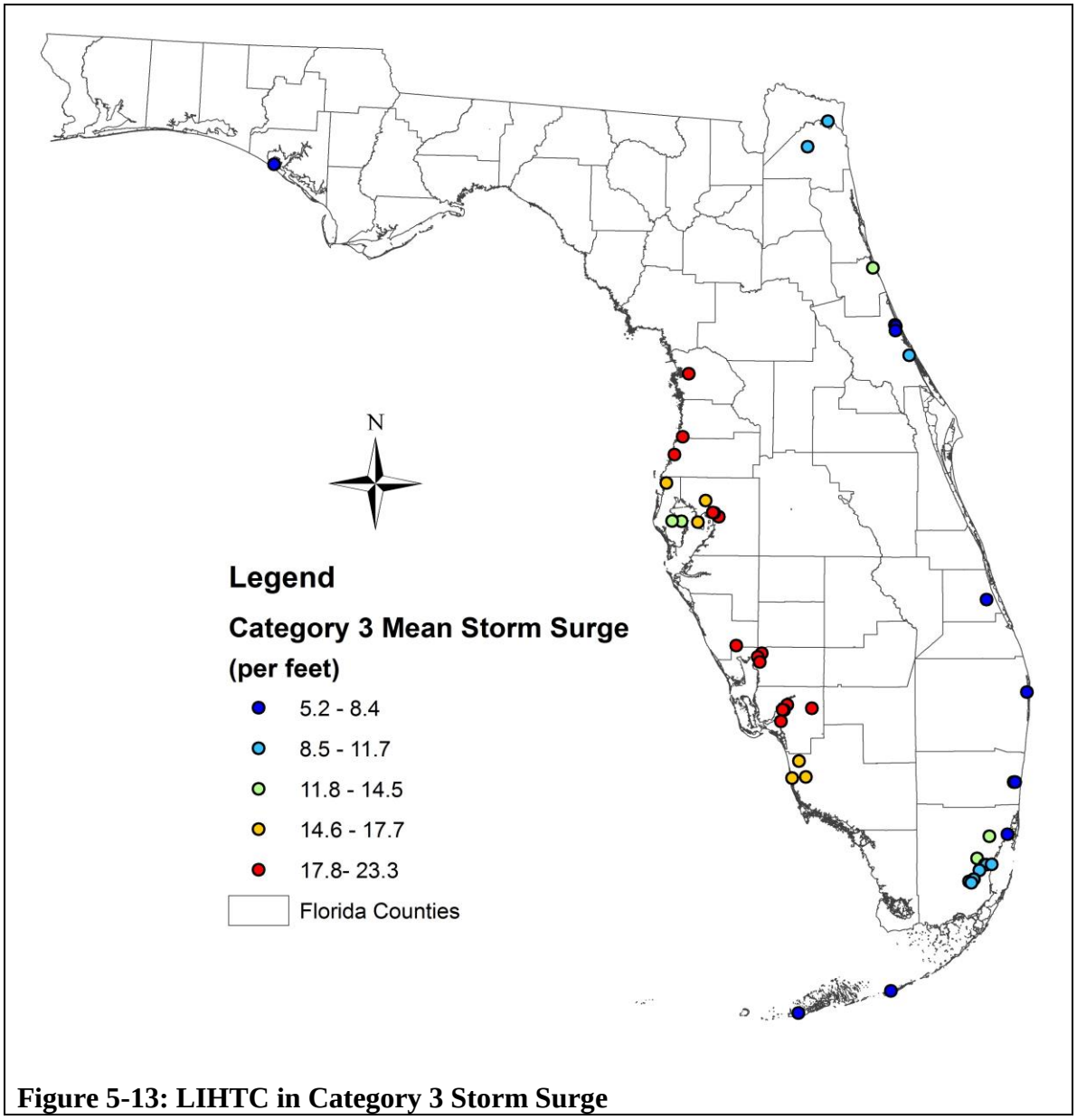

Figure 5-13: LIHTC in Category 3 Storm Surge

Table 5-13: Estimated Damages to LIHTC in C3M Storm Surge

County Identifiers		*Storm Surge* *C3M*					% of Potential Loss by County	Estimated Value of Potential Damages
FIPS	State/County	Min	Max	# of LIHTC Developments	# of LIHTC Units in SS	Total # of LIHTC Units	C3M	C3M
12	Florida	5.2	23.3	191	26,111	143,409	18%	$ 988,301,350
86	**Miami-Dade**	**5.2**	**12.8**	**57**	**8137**	**23048**	35%	$ 307,985,450
21	**Collier**	**15.8**	**17.4**	**19**	**3532**	**4059**	87%	$ 133,686,200
57	Hillsborough	12.2	19.3	20	2591	12456	21%	$ 98,069,350
71	**Lee**	**17.7**	**20.4**	**15**	**2586**	**3472**	74%	$ 97,880,100
15	**Charlotte**	**8.9**	**20.4**	**7**	**1399**	**1481**	94%	$ 52,952,150
103	Pinellas	9.4	17.1	11	1373	2890	48%	$ 51,968,050
31	Duval	7.5	12.2	7	1298	9677	13%	$ 49,129,300
11	**Broward**	**5.2**	**6.3**	**7**	**971**	**9370**	10%	$ 36,752,350
127	Volusia	7	11.8	7	940	4036	23%	$ 35,579,000
87	**Monroe**	**5.4**	**9.7**	**10**	**612**	**625**	98%	$ 23,164,200
115	Sarasota	12.4	17.9	7	424	1069	40%	$ 16,048,400
99	**Palm Beach**	**6.8**	**6.8**	**5**	**319**	**8388**	4%	$ 12,074,150
61	**Indian River**	**6.7**	**12.1**	**2**	**303**	**2366**	13%	$ 11,468,550
101	Pasco	17.2	19.5	2	296	1429	21%	$ 11,203,600
89	Nassau	11.8	14.2	2	189	537	35%	$ 7,153,650
111	**St. Lucie**	**5.2**	**5.2**	**1**	**182**	**2264**	8%	$ 6,888,700
81	Manatee	10.6	10.6	1	176	2332	8%	$ 6,661,600
17	Citrus	18.2	23.3	3	170	458	37%	$ 6,434,500
5	Bay	7.9	7.9	1	160	1142	14%	$ 6,056,000
53	Hernando	20.1	20.1	1	128	878	15%	$ 4,844,800
35	Flagler	13.5	13.5	1	100	314	32%	$ 3,785,000
109	St. Johns	13.8	13.8	1	88	989	9%	$ 3,330,800
37	Franklin	15.9	18.2	2	55	85	65%	$ 2,081,750
19	Clay	5.7	5.7	1	53	877	6%	$ 2,006,050
75	Levy	21.7	21.7	1	32	221	14%	$ 1,211,200
9	**Brevard**					**2882**	0%	$ -
33	**Escambia**					**1410**	0%	$ -
91	Okalossa					460	0%	$ -
113	**Santa Rosa**					**212**	0%	$ -
45	Gulf					111	0%	$ -
129	Wakulla					34	0%	$ -
TOTAL				**191**	**26,114**	**99,572**		**$ 988,414,900**

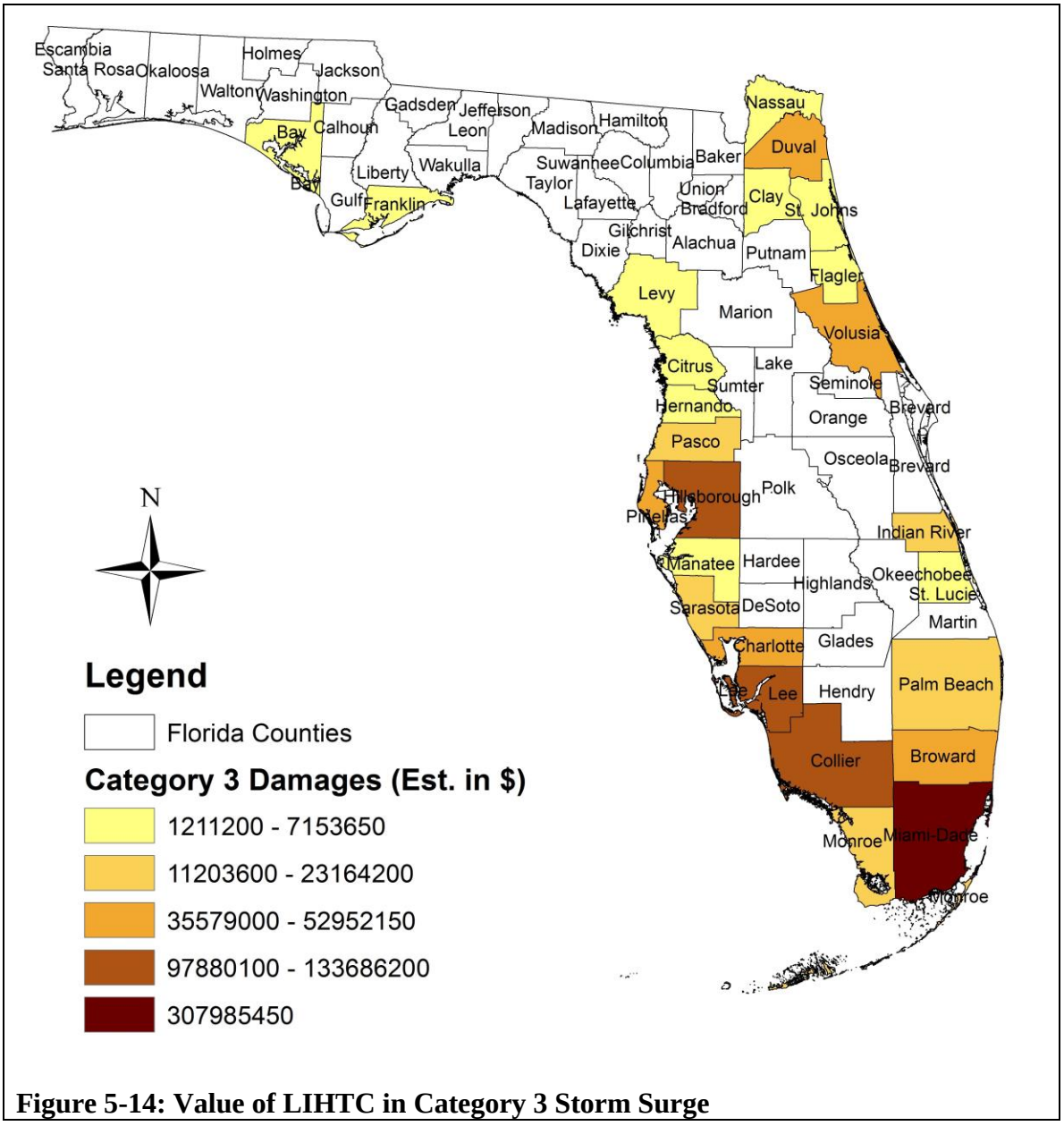

Figure 5-14: Value of LIHTC in Category 3 Storm Surge

C5H - Category 5 High Tide

A worst case scenario was applied to compare with an average Category 3 storm (Figure 5-15 and Figure 5-16). Fifteen counties have the potential for damage to more than 50% of LIHTC housing stock in the event of a C5H storm. Six of these counties were recommended for housing production by HWG. The top five counties for percentage of losses are at risk of losing more than 94% or more of LIHTC stock. Charlotte, a Tier I county, and Wakulla counties could potentially see all LIHTC housing stock damaged or destroyed by a Category 5 storm.

The top five counties with the greatest number of LIHTC units in a C5H storm surge area includes three counties preferred in the HWG report in one or both 2005 and 2006 QAPs (Table 5-9). Nearly half of LIHTC in Miami-Dade is at risk with 12,833 units located in a C5H storm surge boundary. Broward County could potentially face damages to 83% of its LIHTC stock with 9,370 units at risk. Hillsborough, Collier and Duval counties have a combined 10,853 LIHTC units subject to damages from a C5H storm surge. Collier County is at risk for 87% of LIHTC units located in the county and could see potential damages to more than 3,500 household units.

Based on the two year average value from the Tax Credit Group sales analysis of LHTC properties in the southeast, the same estimated value of $37,850 was applied to potential damages in the C5H analysis. The total value of all Florida LIHTC located within a Category 5 storm surge area is $1.8 billion. As in the C3M analysis, Miami-Dade accounted for the highest potential damage costs exceeding $485 million. Three counties represented in HWG tiers or the 2005/2006 QAPs have units at risk in a C5H

storm surge. Miami-Dade and Broward represent two HWG tiers and have the highest potential damage costs (Figure 5-17). Every coastal county analyzed faces some potential for damages from a Category 5 storm. Wakulla County is among those with the least potential dollar value of damages. Wakulla has one LIHTC development with 34 units. Even this small county faces damages to all of its LIHTC units at a potential cost of more than $1.2 million.

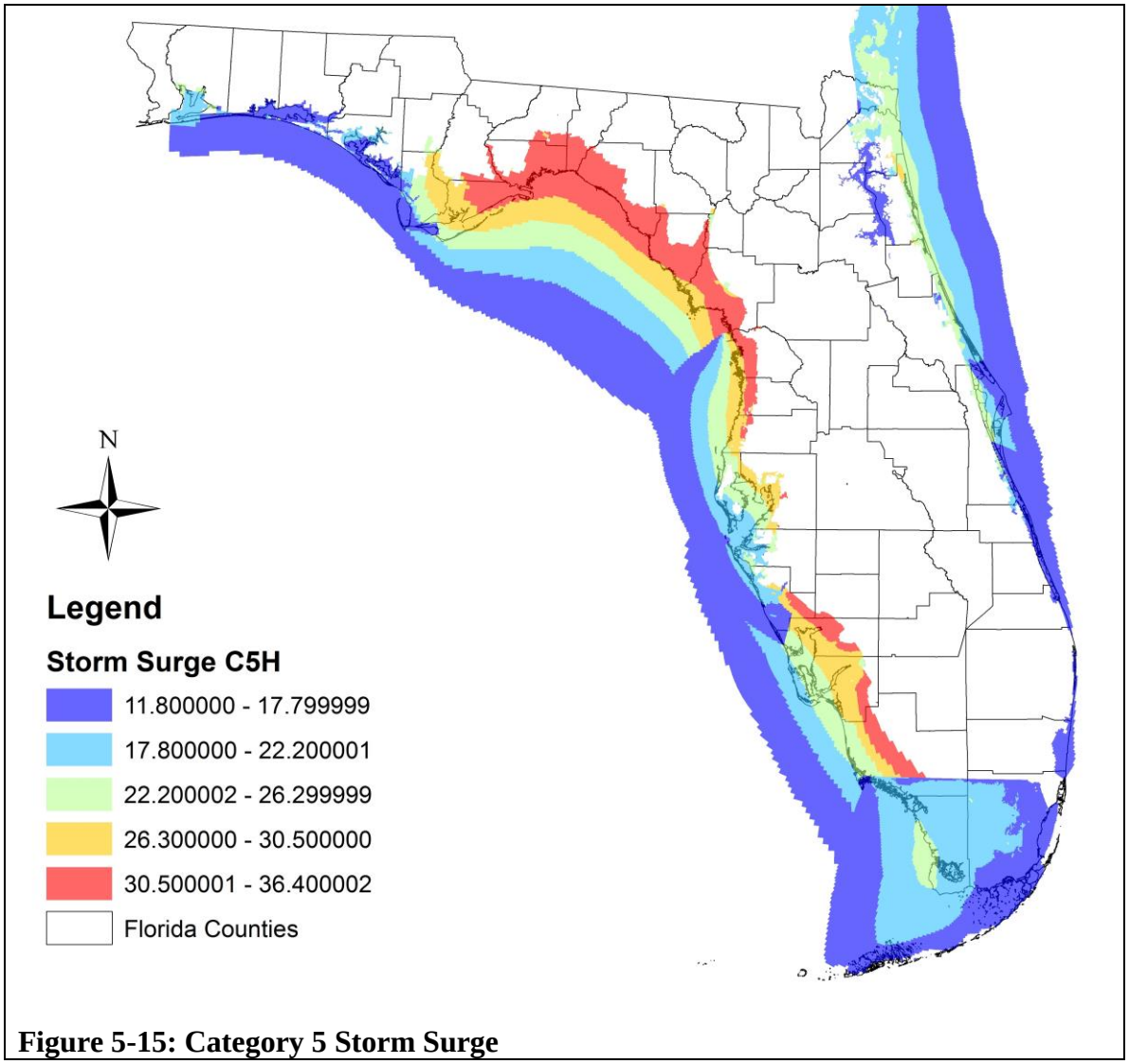

Figure 5-15: Category 5 Storm Surge

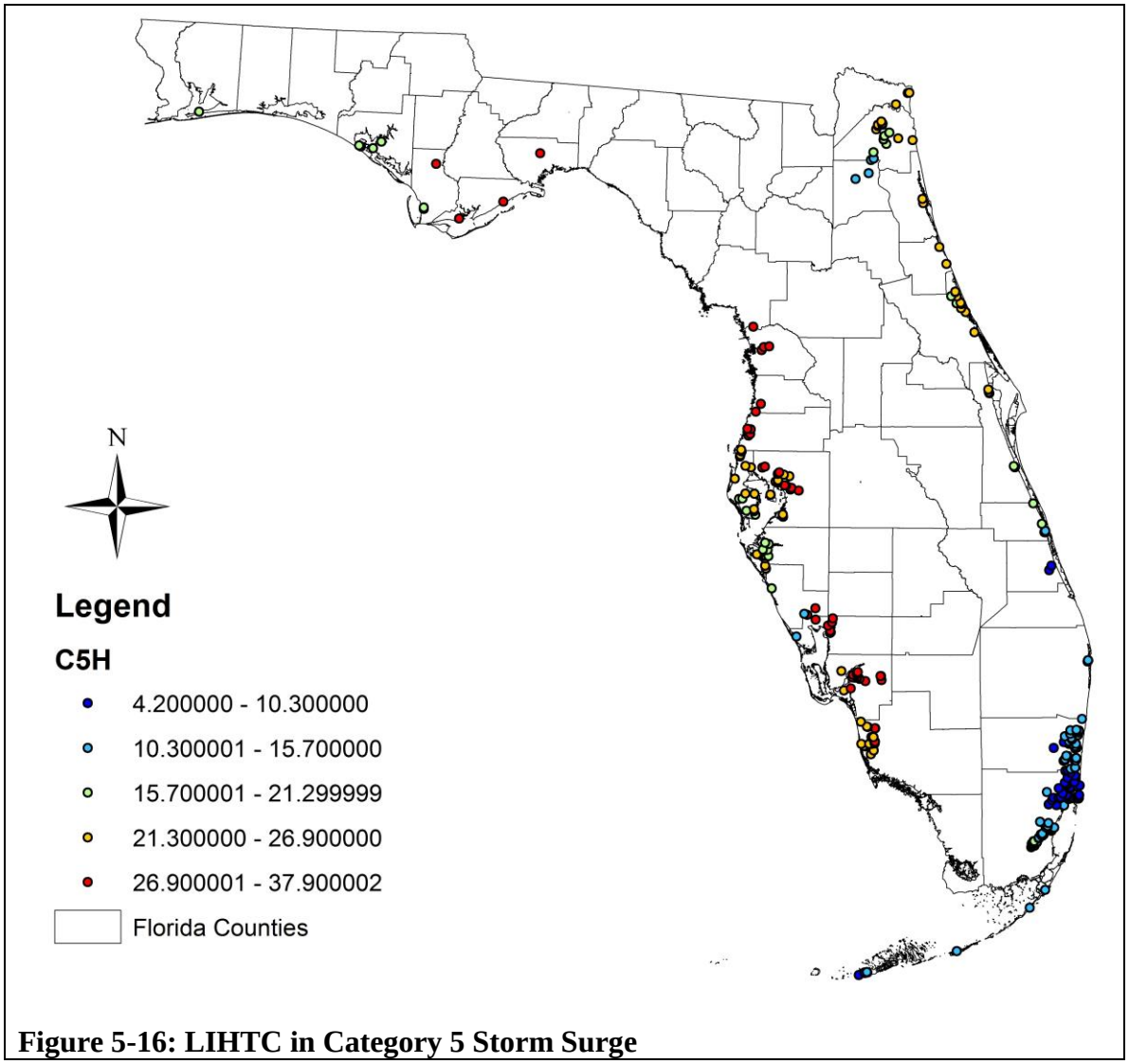

Figure 5-16: LIHTC in Category 5 Storm Surge

Table 5-14: Estimated Damages to LIHTC in C5H Storm Surge

County Identifiers		*Storm Surge* *C5H*					% of Potential Loss by County	Estimated Value of Potential Damages to LIHTC Housing
FIPS	State/County	Min	Max	# of LIHTC Developments	# of LIHTC Units in SS	Total # of LIHTC Units	C5H	C5H
12	Florida	4.2	37.9	343	48,014	143,409	33%	$ 1,817,329,900
86	**Miami-Dade**	**4.2**	**19.5**	**99**	**12,833**	**23048**	56%	$ 485,729,050
11	**Broward**	**5.5**	**13.1**	**46**	**7784**	**9370**	83%	$ 294,624,400
57	Hillsborough	20.8	32.6	25	3875	12456	31%	$ 146,668,750
21	**Collier**	**23.6**	**28.5**	**19**	**3532**	**4059**	87%	$ 133,686,200
31	Duval	14.5	24.5	19	3445	9677	36%	$ 130,393,250
71	**Lee**	**26.3**	**34.8**	**18**	**3270**	**3472**	94%	$ 123,769,500
127	Volusia	17	25.5	12	2149	4036	53%	$ 81,339,650
103	Pinellas	16.7	26.4	14	1995	2890	69%	$ 75,510,750
81	Manatee	17.8	27.5	13	1789	2332	77%	$ 67,713,650
15	**Charlotte**	**14.5**	**32.1**	**8**	**1481**	**1481**	100%	$ 56,055,850
61	**Indian River**	**15.5**	**20**	**6**	**1085**	**2366**	46%	$ 41,067,250
9	**Brevard**	**20.7**	**24.7**	**6**	**913**	**2882**	32%	$ 34,557,050
115	Sarasota	14.7	31.9	12	880	1069	82%	$ 33,308,000
101	Pasco	24.1	29	5	769	1429	54%	$ 29,106,650
33	**Escambia**	**19.3**	**19.7**	**2***	**667**	**1410**	47%	$ 25,245,950
87	**Monroe**	**9.7**	**14.4**	**10**	**612**	**625**	98%	$ 23,164,200
89	Nassau	22.4	23.3	5	320	537	60%	$ 12,112,000
99	**Palm Beach**	**12.2**	**12.2**	**5**	**319**	**8388**	4%	$ 12,074,150
53	Hernando	30.1	32.9	2	318	878	36%	$ 12,036,300
5	Bay	12.8	13.5	3	307	1142	27%	$ 11,619,950
19	Clay	14.6	15.6	2	211	877	24%	$ 7,986,350
111	**St. Lucie**	**8.2**	**8.9**	**2**	**182**	**2264**	8%	$ 6,888,700
17	Citrus	32.7	37.9	3	170	458	37%	$ 6,434,500
35	Flagler	20.1	24.4	2	142	314	45%	$ 5,374,700
109	St. Johns	24.1	24.2	2	100	989	10%	$ 3,785,000
45	Gulf	14.9	15.2	3	88	111	79%	$ 3,330,800
37	Franklin	22.4	31.5	2	55	85	65%	$ 2,081,750
91	Okalossa	17.3*	17.3	1	50	460	11%	$ 1,892,500
113	**Santa Rosa**	**18.9**	**18.9**	**1**	**46**	**212**	22%	$ 1,741,100
129	Wakulla	31.1	35.2	1	34	34	100%	$ 1,286,900
75	Levy	36.8	36.8	1	32	221	14%	$ 1,211,200
TOTAL				347	49453	99572		$ 1,871,796,050

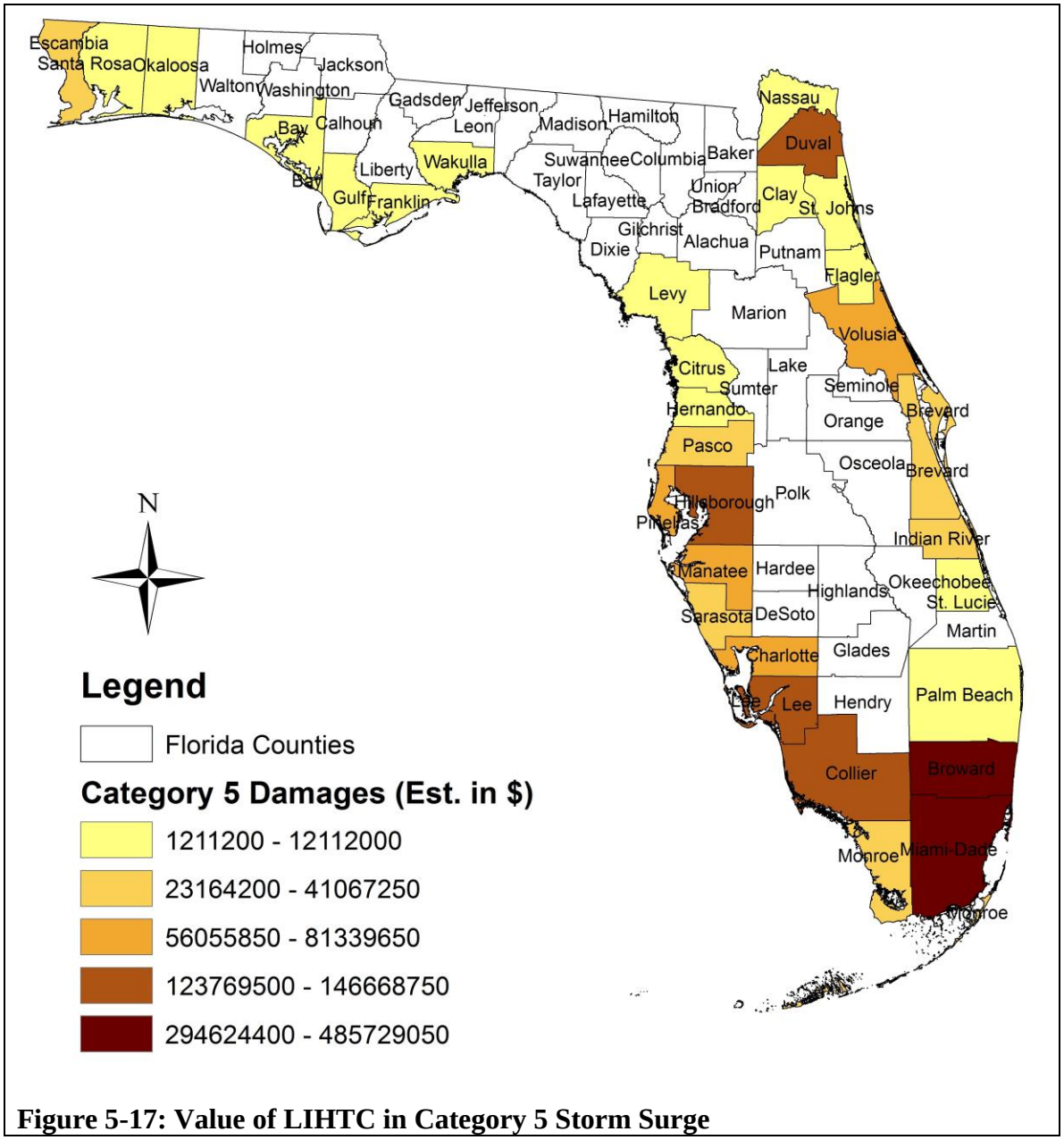

Figure 5-17: Value of LIHTC in Category 5 Storm Surge

LIHTC Coastal and Non-Coastal Development Trends 2004-2010

A trend line was applied to LIHTC units developed between 2004 and 2010 (Figure 5-18). Overall LIHTC development declined during the study period. Coastal LIHTC outpaced units developed in inland counties. Development in inland counties remained fairly steady while coastal development closely followed the overall development trend. A significant decrease in LIHTC development occurred before the onset of the economic downturn in 2007. This observation could have been influenced by broader economic trends that were not tested for this study, but could be considered in any future research. The subsequent decline in housing markets affected LIHTC because tax credits are used to offset income from profits. Investors saw steep declines in income and the decline in value of tax credits by 2008, having a negative impact on the amount of capital available for the program (Harig-Blaine, 2011). Non-coastal county LIHTC development has remained consistent since 2006.

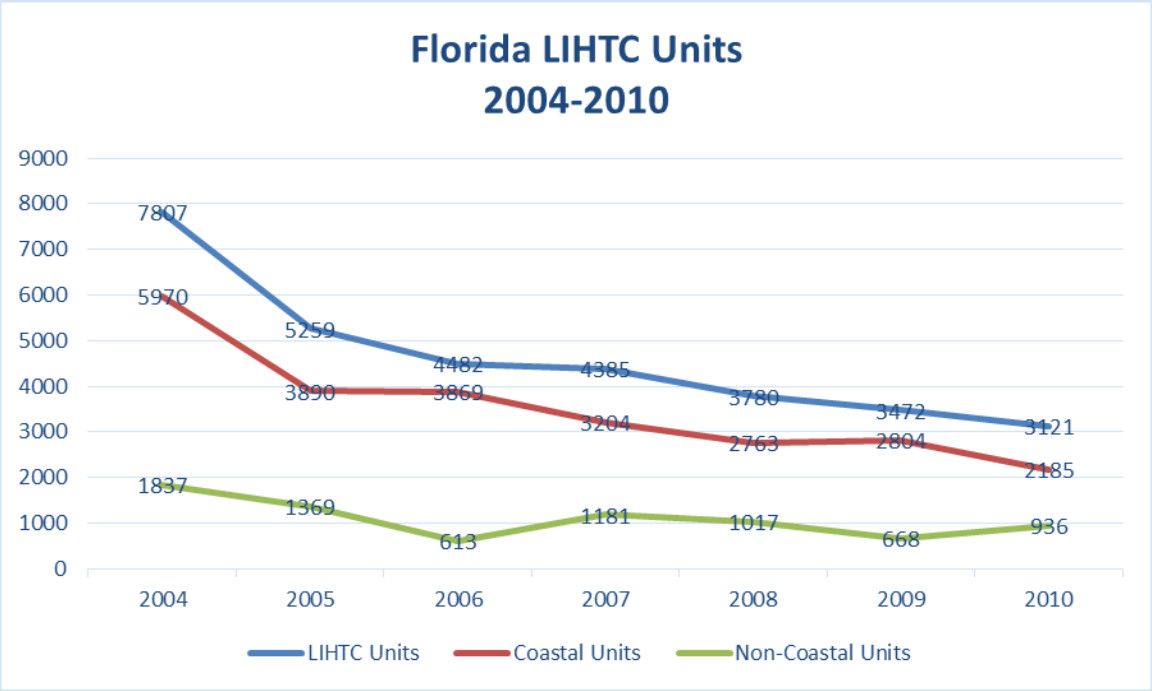

Figure 5-18: LIHTC Development Trends 2004-2010

A trend line was then applied only to coastal LIHTC development from 2004 to 2010 (Figure 5-19). Since 2004, coastal LIHTC development has declined while the number of units at risk of a C5H storm surge has increased. Units in a C3M storm surge showed a marked decrease between 2004 and 2006 remaining steady through 2010. As coastal LIHTC development has declined, units in the most hazardous areas have increased. Since 2006, developments in C3M and C5H storm surges have remained relatively stable with a slight dip in C5H development since 2009. As a percentage, LIHTC development on the coast appears to be increasing in high hazard areas.

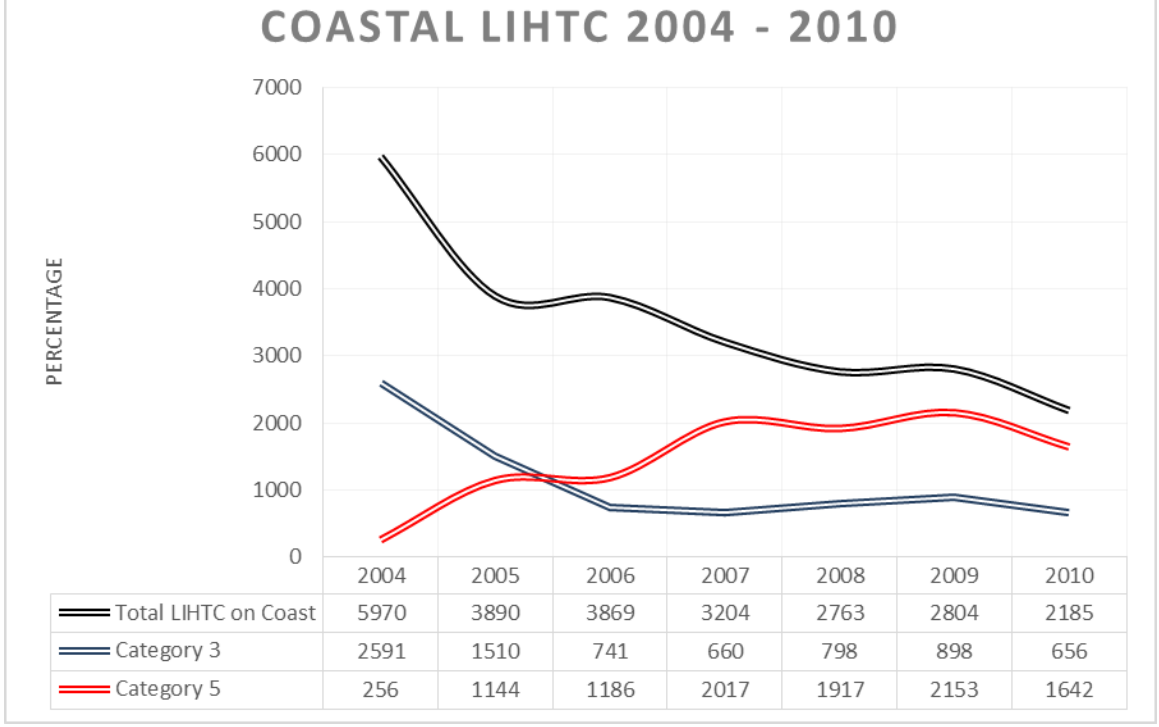

Figure 5-19: LIHTC Coastal Development

A GIS Analysis of LIHTC Funding

An analysis of funding resources was completed using the statistical analysis features of GIS. The HUD database indicated that LIHTC producers used tax exempt bonds more often than any other subsidy, over 31% of the time between 1987 and 2012. HOME funds were reportedly used 5% of the time and CDBG was used only one percent. These percentages have little to no significance because of underreporting in these database categories. CDBG was not reported 81% of the time. HOME funds were unreported 77% of the time. More than $18 million in HOME funds were allocated for 24 projects in 25 years of LIHTC.

Total allocations for both programs were analyzed. In 2003, no allocations were reported, and only minimal reporting was given from 2004 to 2007. The final three years of the study period had more extensive reporting of funding data and will be discussed. The total allocations for CDBG and HOME ranged from a high of nearly $63 million in 2009 to a low of $29 million in 2010. Coastal counties received the greatest share of these funds. In 2008, 74% of CDBG and HOME funds were applied to coastal developments. This percentage increased to 90% in 2009 and exceeded even that in 2010 (Table 5-10). These figures are inconclusive and provide nothing more than anecdotal observations however they do indicate some support for HOME and CDBG based on the stated preferences of developers from Phase II of the study.

Table 5-15: LIHTC Allocations 2003-2010

Year	2003 [1]	2004 [2]	2005 [2]	2006 [2]	2007 [2]	2008	2009	2010
Total CC Developments	45	37	38	20	24	38	43	20
Total Allocation	0	$ 1,116,080	$ 6,875,524	$ 30,165,146	$ 29,374,556	$ 53,938,578	$ 62,639,332	$ 29,648,708
Allocation in CC	0	$ 1,116,080	$ 6,012,471	$ 17,079,080	$ 21,262,413	$ 39,650,149	$ 56,236,336	$ 27,676,258
% Difference		100%	87%	57%	72%	74%	90%	93%

Source: Department of Housing and Urban Development LIHTC Database

Notes: [1] Allocations were not reported in 2003

[2] Allocation inputs for 2004-2007 were incomplete

The Human Factor

The results of this study focus primarily on developer risks and decision-making related to LIHTC development during disaster recovery. One cannot discount the human factor. Residents in LIHTC subject to storm surge are subject to risk too. According to the U.S. Census Bureau, household size in Florida averages 2.61 persons per unit. The number of people displaced in the state from a Category 5 storm during high tide could affect more than 125,000 people. Charlotte County could face the loss of every LIHTC unit due to storm surge, impacting 3,873 low- and working-class households in the county. Large counties like Miami-Dade and Broward face large scale population displacement. Working class households living in Miami-Dade County would be devastated with more than 20,000 potential displaced by a Category 3 storm and over 30,000 could be displaced should a Category 5 storm hit the area. A Category 3 hurricane in Broward County should have minimal impact, affecting 2,500 households. If a Category 5 hurricane hits Broward, that number increases exponentially to over 20,000. Additional studies can identify the extent of human risk associated with select counties at all hurricane category levels.

SUMMARY

Miami-Dade had the greatest number of LIHTC located in the boundaries of a potential storm surge. There are 23,048 LIHTC units within the county and 35% of them are located within a C3M storm. Over half, 12,833 units, are at risk of storm surge in the worst case scenario of a C5H storm hitting the Miami coast. The next area most at risk was Broward County with 7,784 LIHTC units located in storm surge boundary. While only 10% of Broward's LIHTC units were at risk from a C3M, in a C5H worst case scenario, more than 83% of LIHTC in the county are at risk of incurring damages.

The total LIHTC at risk in a C5H storm is more than $1.8 billion. A Category 5 storm could conceivably wipe out LIHTC units in Charlotte, Gulf, and Wiculla counties. Even a Category 3 storm would place a significant burden on affordable housing in Charlotte County with as many as 94% of LIHTC located within storm surge boundaries of between 9 and 20 feet. Miami-Dade poses the greatest risk of loss to the state even though only 35% of units are at risk in a C3M storm and 56% of units are at risk in a C5H storm surge. A Category 3 storm could potentially cost more than $307 million for reconstruction assuming all LIHTC units within the boundaries of the storm surge were damaged. In a worst case scenario, a conservative estimate of $485 million is at stake for LIHTC properties for Miami-Dade alone. Monroe County includes the Florida Keys. Phase I identified Florida Keys was a preferred location in each of the QAPs analyzed. Ninety eight percent of LIHTC is at risk from either storm category in Monroe County with potential loses of over $23 million.

The revealed preferences of LIHTC developers identified using GIS indicates that developers continue to develop a higher number of units on the coast. Coastal development is driven by population, which is higher in densely populated coastal areas. LIHTC developers stated a preference for less risky coastal development, a sentiment that was diminished by policy preferences for coastal development. Ultimately, coastal LIHTC development from 2004 to 2010 outweighed the potential risks associated with a hazardous coast.

Chapter 6

UNDERSTANDING DIVERGENT RISKS

LIHTC DEVELOPMENT AFTER THE 2004 HURRICANE SEASON

The purpose of this study was to identify LIHTC risk during disaster recovery. The overriding force guiding this research was to understand how perceived risk from disaster influenced development decisions. The case study approach was the perfect platform for conducting a robust investigation of public discourse, profitability, and affordable housing supply. The practicality of the study offers implications for affordable housing policy in the context of disaster and the broader impact of climate change. The study ultimately confirmed a conflict between the human systems we have created and the natural systems we must adapt to, particularly in the face of sea level rise and storm surge.

Policies that drive LIHTC housing production also drive thousands of low-income people into high hazard areas creating additional risk to those individuals, private owners, and government at the federal, state and local levels. Quantitatively, the numbers speak for themselves. More than 48,000 LIHTC households in Florida are at risk from storm surge. Given that Florida averages 2.6 persons per household, this means that approximately 125,315 people live in LIHTC properties that are susceptible to storm surge from a Category 5 storm. Owners of LIHTC also face hazards related to hurricane disaster. Over 340 developments are located in storm surge hazard areas with potential

flooding in a range from 4.2 to 37.9 feet suggesting that potential damage could be significant.

This study undertook LIHTC risk from a social constructivist paradigm that reflects the experience and expertise of multiple stakeholders. Figure 6-1 provides a comparison of the findings from the three phases of this research. Phases I and III built a foundation of thought for this study by identifying preferences from the public agency and verification of development outcomes for LIHTC. Phase II provided the social context. During this phase, developers said they need more resources, less regulation, more flexibility, and preferred to avoid location risk associated with storm surge. They also prefer subsidies that allow them to be profitable. Stated preferences reveal that developers understand risks associated with coastal development, and given the appropriate incentives, they would avoid hazardous areas, including areas subject to storm surge. The fervor of the discussion, however, stems from the qualitative feedback that shows an awareness of unsustainable policies that ameliorate housing problems but also create unintended, risky consequences. It is interesting to note, however, that in spite of the individual stated preferences indicating this awareness, preferences revealed in the GIS analysis indicate that developers most often developed in hazardous coastal areas more often than not. Additional research is needed to differentiate the effects of policy and market forces that influence LIHTC development decisions.

This study recognizes the risks to people who live in LIHTC units subject to storm surge hazards by identifying the number of people at risk in Category 3 and Category 5 hurricanes. Others have identified those groups most at risk within the

characteristics related to economic, gender, race, and age (Cutter and Emrich, 2006; Fothergill and Peek, 2004). These are among the households that rely on the affordable rents available through the LIHTC program. Many of the solutions provided in the context of this research address the LIHTC industry specifically as well as steps that can be taken to protect those households living in LIHTC situated in storm surge boundaries.

6-1: Comparison of Phases I, II and III

Total LIHTC Units 2004-2010	No of Units	% of Total
Total Non-Coastal	11663	26%
Total Coastal	32995	74%
Total QAP 2005 (Counties)	4818	11%
Total QAP 2006 (Counties)	11253	25%
Total HWG		
Tier I	4874	11%
Tier II	5052	11%
Tier III	2256	5%
Tier IV	20052	45%

This purpose of this chapter is to present some concluding thoughts and recommendations for stakeholders of affordable housing in general, and specifically for disaster recovery.

A BRIEF REVIEW

In Chapter 2, the concept of risk as a social science was introduced. According to Bradbury (1989), this is where cooperative decision-making occurs. The affordable housing literature amplifies the voices of the low and moderate income population. We know that people who suffer in poverty suffer more during disaster recovery. We know that housing cost burdens plague owners and renters alike regardless of income. We are

aware that nearly 35% of households are renters, and many of these spend more than half their income on rent (JCHS, 2013). Over 12% of the population lives in multifamily housing. Less than 15% of these developments are funded using the LIHTC. Even though most LIHTC households have higher incomes relative to those in other subsidized housing, nearly half the tenants have extremely low incomes and pay more than 30% of their income on rent. In spite of a developer's ability to acquire additional incentives for development, the program does little to offset cost burdens for most households.

Disaster exacerbates affordability, especially when affordable housing shortages existed prior to a disaster event (Comerio, 1997; Levine et al, 2007; Reece et al, 2011). Recovery is well understood to perpetuate rental housing shortages as redevelopment brings an influx of workers. Development costs increase when land, labor and material are in greater demand. Redevelopment brings the promise of a better community with better technology. However, limited resources require that choices must be made. Affordable housing advocates argue that poverty solutions, such as HOPE VI and mixed income development, fail to provide sufficient quantities of affordable housing (Geotz, 2004; McCarthy and Hanson, 2008; Unity, 2010). Others point to private market solutions, such as vouchers, to suggest otherwise (Vuk, 2008). LIHTC has faced criticism for its failure to provide housing for extremely low income households in general and during disaster recovery (Hooks and Miller, 2006). This study began by recognizing the inability of multifamily owners to bring affordable properties online and sought to ask the question 'why'. The following sections discuss these questions and the broader implications of the study on the industry, policy, and disaster theory.

The framework identified multiple stakeholders from four areas: housing producers (LIHTC for this study), advocacy groups speaking for tenants and low-income households, public policy identified through QAP analysis, and the merging of housing policy and disaster recovery in the wake of the 2004 hurricane season in Florida. The following sets of questions were selected to guide the research:

1) How do LIHTC developers perceive disaster risk? What risk variables have the greatest influence on development decisions?
2) What are the differences in risk perception between for-profit and non-profit LIHTC providers? How do these differences impact the location of low-income multi-family housing within the LIHTC program?
3) Where are LIHTC developments located over the disaster recovery period? Do LIHTC developers avoid areas that experience the greatest impact from the disaster event?

Additional research is needed to identify differences in risk perception between for profit and non-profit LIHTC providers. This study was unable to differentiate development patterns between non-profit and for profit entities. Developers from both business models are encouraged to partner for affordable housing production. The study did, however, provide ample evidence to address how risk perception affects development and the role of policy for influencing location decisions.

The literature provides examples of how policies implemented during disaster assist homeowners over renters and economic redevelopment over affordable housing. Most policies work in favor of business and homeowners, neglecting the needs of

apartment owners who can scarcely take on more debt to repair and rebuild. During recovery, policies tend to address areas with the greatest number of housing damages. Greater attention to storm surge areas could address the unintended consequences of producing replacement LIHTC housing in vulnerable areas.

This research proposes solutions within public choice theory and a social constructivist framework based on the individual experience and knowledge of LIHTC developers. Recommendations have been provided for the industry and government at federal, state and local levels that incorporate findings from this study. Inputs from stakeholders inform the social frame from which low risk, mutually beneficial recommendations are formed. This study relied on the literature for contributions to the social frame and identified specific areas of concern from the Florida LIHTC community.

IDENTIFYING LIHTC RISK

This research revealed that LIHTC professionals are well aware that the cost of affordable multifamily housing production is out of balance with project feasibility without additional incentives for development. Disaster exacerbates this condition. The LIHTC program is subject to typical development risks as well as risks specific to the LIHTC industry. Real estate development and LIHTC risks are discussed in more detail in Chapter 2. This study looked beyond these typical development risks to ask how LIHTC developers perceive recovery risk after a hurricane disaster.

Categorizing risk using a modified STEEP analysis identified the importance of technical risks characterized by those factors that affect real estate performance measures. Internal rates of return, costs, and rent are easily identifiable risks with benchmarks

established well before construction begins. Risks associated with LIHTC dictate that management be especially diligent in maintaining the contracted tenant affordability ratio while staying profitable amidst tight margins (O'Regan and Quigley, 2013; Schwartz, 2010). Experienced management is essential for managing performance risk. The most significant risk criteria identified in this study were economic, described as funding sources (or subsidies) emanating from government policy. Policies that increase equity and reduce debt create the greatest risks when regulations are volatile, either from changes in government or political opinion. Administering agencies can also increase risks when frequent policy changes are made. Green and Olhshansky (2011) and Gotham and Greenberg (2008) described how agency volatility reduced the effectiveness of programs negatively impacting those who were supposed to benefit. Effective and stable government boosts developer confidence but overreach and deep regulations increase risk to profitability. This research does not include measurements of the level of risk that reduces participation because the LIHTC program often has more applications than available funding. What the study does expose are the social constructs that guide LIHTC decision-making. This study demonstrates a framework for the social paradoxes existing between business, people, and institutions. Policies drive action. Available subsidies are distributed based on annual policies that encourage or give preference to coastal development driving LIHTC development in potentially hazardous areas, in spite of risk. Future research is needed to determine if risk can be mitigated by directing subsidies to development in less hazardous areas.

Government regulation can increase pre-construction costs making profit feasibility challenging. High hazard states, like Florida, use regulatory procedures to enforce building codes and land use to mitigate damages from natural hazards. Mitigation techniques include zoning, flood zone regulations, and building codes. Policies that permit construction in high hazard zones, such as in storm surge boundaries, can potentially cause catastrophic damages. Environmental hazards are often disregarded, most likely because increasing populations place demands on policy makers to secure affordable housing. Developers will continue to build in hazardous areas if public policy and funding mechanisms subsidize it. County government can mitigate development in high hazard areas by including public access to site characteristics that include storm surge vulnerability much in the same way that flood zone mapping is provided at the county level.

Chapter 5 identified studies of storm surge effects for specific areas (Fritz, 2008) and applying values to estimate potential losses (CoreLogic, 2011). Policies to reduce the number of units constructed within storm surge areas have yet to be implemented through local planning. Funding subsidies are among the top risks that influences LIHTC development. The funding subsidy is relevant to the production of affordable housing in general. No evidence was found to suggest a greater reliance on funding subsidies during disaster recovery than at any other time even though disaster does create additional burdens on available resources. LIHTC developers require funding subsidies for housing, so risk can be addressed with mitigation or adaptation measures supported

through existing funding sources, such as hazard mitigation grants and low cost disaster loans.

Funding LIHTC

Funding subsidy sources include tax credits, block grants, and special financing often used in conjunction with some traditional financing. Developers stated a preference for additional subsidy allocations from existing programs. This could be in part because of past volatility experiences or reports of program deficiencies by others. LIHTC developers prefer Supplemental LIHTC over all other funding subsidy sources followed by HOME funds and CDBG. Data collection fields in the LIHTC database for HOME and CDBG programs were blank more than two-thirds of the time. A more concerted effort is needed at the state and federal level to collect and report accurate sources of public subsidies for LIHTC. Federal and state policymakers also need to address funding needed to produce adequate numbers of affordable housing units, particularly during disaster recovery.

Location Preferences

Low Income Housing Tax Credit developments are predominantly located on the coast in Florida. Even in the immediate aftermath of disaster, coastal development outpaced LIHTC development in interior counties. Given that Florida is facing hazards caused by climate change, such as sea level rise and extreme hurricane effects, policies could be more proactive in mitigating development in coastal areas. LIHTC developers understand the implications of coastal development. This study established that LIHTC is dependent on resources established in public policy despite developer understanding of

potential hazards. Developers from this study were very clear. Locations near the coast are less desirable, therefore more risky, than locations further from coastal hazards. Yet developers construct LIHTC in high risk locations. Intervening causes could include population, income potential, demand or other factors that have not been developed or analyzed here. LIHTC developers specifically expressed a preference for development away from storm surge hazards. LIHTC in storm surge is at greater risk than LIHTC developed inland; yet LIHTC exists in identifiable storm surge areas. Technology is available to identify potential storm surge. Similar to regulations that inhibit development in flood zones, policy can require multifamily housing be developed in areas with low risk of a storm surge hazard. The high cost of flood insurance also signals that developers find sites in less vulnerable locations. In spite of the cost of insurance and associated risks, developers continue to locate the majority of LIHTC in coastal areas. Insurance costs will be absorbed until profitability is affected. Policy can curtail cost and location risk by encouraging sustainable safe LIHTC development. Storm surge risk reduction can be implemented with QAP guidelines and facilitated through local planning departments and public GIS systems at the county level. Even though LIHTC developers indicated the high cost of insurance and slow insurance payouts as a deterrent to sufficient affordable housing production, flood insurance is essential for properties at high risk of storm surge.

This study does not presume to be a comprehensive cost-benefit analysis, but does attempt to place an estimate of value on LIHTC at risk. Over $123 million was allocated for coastal LIHTC from 2008 to 2010 accounting for 85% of total allocations across the

state. The estimated value of coastal LIHTC within a Category 3 storm surge is more than $900 million. A Category 5 storm puts nearly $2 billion in LIHTC at risk. Either one of these events has the potential to wipe out taxpayer supported affordable housing investment. It would seem that implementing a system to identify storm surge properties is a cost effective policy that could effectively reduce potential damages during disaster benefiting property owners, taxpayers, insurance companies, and tenants. Future studies are needed for a more robust valuation of LIHTC units.

In summary, developers stated a preference for development on non-hazardous sites but Phase III results revealed the majority of LIHTC continue to be developed on the coast. Population growth is a major driver for coastal development, so it is inevitable that more LIHTC or other affordable housing will be needed in coastal counties. Policy drives development, which means it will be up to policymakers at all levels of government to control development in hazardous storm surge areas.

POLICY IMPLICATIONS

The findings of this research suggest that policy drives LIHTC development. Market forces also influence where LIHTC development is needed due to economic development and coastal population trends. Coastal population is expected to continue in an upward growth for the foreseeable future which means that policy and market forces are likely to support LIHTC growth in hazardous coastal communities. Potential costs for at risk development suggest that an assessment should be undertaken to identify solutions to mitigate risks for public and private interests. As more is learned about the impact of climate change on coastal systems, it has become obvious that a concerted

effort should be made to identify risks and adopt policies for adaptation and risk reduction techniques. Studies for adaptation and mitigation come primarily from the climate change literature. For the most part, the literature is largely conceptual. However recent studies are beginning to identify specific techniques and policy ideas.

Disaster risk reduction is defined by the United Nations Office for Disaster Risk Reduction (UNISDR) as *"the conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development."* Risk reduction identified in this study includes development in low hazard areas, low cost grants and loans for production, and additional tax credits to aid in production. Policy measures can be tied to these programs to implement adaptation and mitigation techniques for existing and new LIHTC development.

According to the Stockholm Environment Institute, adaptation is an ongoing, reiterative six stage process that includes *"information development, awareness raising, planning, design, implementation, and monitoring"* (Dougherty and Fencl, 2008, p. 38). Adaptation is "*anything that reduces the negative effects of climate change"* including minimizing exposure (Langis, 2013 quoting Warren and Egginton, 2008, p. 6). Adaptation and risk reduction are methods toward resiliency (Hamin and Gurran, 2009). Tol et al. (2008) define adaptation as *"the planned or unplanned, reactive or anticipatory, successful or unsuccessful response of a system to a change in its environment"* (p. 432).

Adaptation has evolved from the initial idea that mitigation would be sufficient to curtail the impact of climate change. Early literature focused on hard- and soft- structural techniques such as barricades and seawalls, beach nourishment, and strategic retreat (London and Volonté, 1991). Klein et al (1999) stressed the importance of coastal adaptation through an iterative four-step process that includes data collection and raising awareness, identifying planning and design strategies, implementation, and monitoring and evaluation. The first decade of 2000 saw increased calls for using technology to educate multiple stakeholders about the need to reduce coastal vulnerability to the effects of climate change (Klein et al, 2001; Adger et al, 2005). Since then more attention has been given to the benefit of regional cooperation and identifying specific techniques for adaptation and risk reduction. Specific tools to enhance resilience include taking action at local and regional scales and avoid incentives that increase hazardous conditions (Adger et al., 2005). Jacob, Gornitz and Rosenzweig (2007) identified structural and non-structural solutions to reduce risk. Structural solutions such as constructing artificial barriers and other physical defenses continue to be put forward. Non-structural solutions involve policy initiatives to curtail growth in hazardous sites. Some of these solutions address impending sea-level rise, but are also useful for reducing risk associated coastal hazards in general. The remainder of this chapter will offer recommendations stemming from this study to address risks for existing and proposed LIHTC development.

ADDRESSING LIHTC FUNDING AND STORM SURGE HAZARDS

This study suggested that policy influences development decisions. Policy will be the driving force to mitigate hazardous effects with adaptation and risk reduction

techniques. Technical guidelines presented by the IPCC have been accused of providing little usable information for policy makers, questioning the capacity to adapt given available resources and political will (Carter, et al, 1994). Tol et al. (2008) suggest that vulnerability is determined by the capacity to adapt (p.434). Options for adaptation are of little consequence if the capacity to employ them is out of reach. Recommendations for adaptive and risk reduction measures resulting from this study attempt to be cognizant of the adaptive capacity for implementation specific to industry, and policies at local, state, and federal levels.

LIHTC Risk Reduction - Industry

The LIHTC industry has a responsibility to identify and promote strategies to reduce risk for existing building stock and mitigate risk for future development. In the case of LIHTC, there is also the human factor and responsibility for those being served under the program. This study identified stated preferences of LIHTC professionals acknowledging location risk relative to the coast and storm surge. Revealed preferences identified a significant number of LIHTC units in storm surge areas. Three steps are recommended at the industry level to address LIHTC risk reduction:

1) Identify LIHTC inventory situated in storm surge boundaries in order to determine existing risk.
2) Mitigate potential damages by purchasing flood insurance for existing properties located in storm surge areas.
3) Analyze proposed sites for storm surge hazards during the pre-construction phase of development.

These three steps require the industry to take proactive steps to insure LIHTC developments are located in areas less vulnerable to flooding associated with storm surge. Identifying risk for existing units provides an opportunity to take steps to reduce future risks from storm surge.

LIHTC Risk Reduction - Local Government

Local government is a frontline warrior against the impact of climate change and the threat of coastal hazards. It is this level of government that faces the immediate threat to its population and existing development. Policy measures and adequate enforcement from local government are essential for implementing actions that support risk reduction. Three recommendations for risk reduction from local government include:

1) Provide public access to storm surge models in county geographic information systems.

2) When considering approval for a local LIHTC development, require that the extent of storm surge hazard related to the proposed site be identified.

3) Develop inter-agency policies addressing site risk of developments within storm surge areas.

As stated in Chapter 3, local government is required to approve a specific LIHTC development before an application is filed with the housing authority. This places some responsibility for hazard mitigation in the lap of local government. County-level agencies, including planning and emergency management, should be consulted for policy development that determine acceptable risk for proposed LIHTC multifamily housing

within storm surge areas. Absent such policies, public access to potential storm surge mapping resources will allow LIHTC developers and others to identify and mitigate risks for internal decision-making.

LIHTC Risk Reduction - State Government

State government works as a conduit for services and funding between federal and local governments. It is at this level of government that funding is identified and distributed. Unlike local government, state measures can act with regional and federal stakeholders to adopt broader measures to produce adequate numbers of LIHTC in safe locations. Recommendations for state government include:

1) Adopt funding restrictions that discourage development of LIHTC in storm surge areas.
2) Create disaster bonds targeted for LIHTC as an additional subsidy for LIHTC development in non-hazardous areas.

LIHTC Risk Reduction - Federal Government

The federal government has relinquished much of its capacity for action to the state level in recent years. However there are some significant public policy actions that can support state and local efforts to mitigate coastal hazard risks while still supporting affordable housing production.

1) Target disaster grants and mitigation grants to LIHTC during disaster recovery as additional support for new development in areas not subject to storm surge hazards.
2) Increase access to funding using grants or supplemental tax credits that will support efforts by the affordable housing industry to improve resilience for existing developments.

CONTRIBUTION TO DISCOURSE IN DISASTER THEORY

Disaster theory seeks to understand decision-making and preferences in the context of disaster. As stated in Chapter 2, political and social pressures require quick action while integrating lessons learned from past experience. Complexity exists because limited resources are shared among multiple disciplines competing for attention based on political will and community needs. Affordable housing is just one of the many disciplines that contribute to this emerging theory. The findings from this study point to the significance of policy in decision-making for private production of affordable multifamily housing. This research builds on other studies that have revealed how housing recovery takes place in the aftermath of disaster by focusing specifically on the LIHTC program.

RECOMMENDATIONS FOR FUTURE RESEARCH

In order to gain a more thorough understanding of the risk associated with LIHTC during disaster recovery along the coast it is recommended that future research identify the extent of LIHTC units within all categories of storm surge. Additional research is needed to determine the per unit value of LIHTC units. Current valuation studies are formulated from national sales through private companies, only one of which was utilized in this work (Tax Credit Group, 2014). A more robust study of LIHTC valuations is needed to understand the scope of potential losses at local, state, regional and national levels.

The study of LIHTC and disaster could also benefit from an expansion of the survey used in this study after some modifications. While surveys could be conducted on

a state by state basis, this practice is impractical because of the number of national companies participating in the field. The survey used in this study is not designed for other disaster types. Any future survey should focus on disaster recovery associated with hurricanes in coastal states.

This study did little to identify similarities and differences between for profit and non-profit LIHTC producers. Additional research can utilize the methods from this study to identify how for-profit and non-profit companies are influenced by risk in their development decisions. In the future, the survey can be revised to allow for cross tabulations between for-profit and non-profit LIHTC. Statistical analysis using GIS also has the capability of categorizing risk by for-profit and non-profit entities. These steps are important to understand how business structure affects risk taking and if partnerships between the two types of entities results in less risk to LIHTC units and the households that inhabit them.

CONCLUSION

This study was built from a concern for the failure of disaster recovery to solve affordable housing problems during disaster recovery. Disaster recovery is a redevelopment opportunity that incorporates competing needs given available resources. Unfortunately, just as renters fall behind homeowners in disaster assistance, affordable multifamily housing owners also find it difficult to obtain sufficient funding to participate fully in recovery. This study focused specifically on the LIHTC industry which faces fewer barriers to recovery, but is influenced by policy. Policy drives the LIHTC industry by driving competition through limiting tax credits available at the federal level. State

and local level preferences impact funding and location. LIHTC producers are well informed of coastal risks and have indicated a preference to avoid hazardous conditions. LIHTC placed in service between 2004 and 2010 are predominantly in coastal areas in Florida, and some developments are located within hazardous storm surge boundaries. The financial risks associated with these properties are significant and warrant consideration of efforts to adapt and improve resiliency. This study specifically identified risks for LIHTC in Florida and does not pretend to be significant to any other coastal state. More in depth studies are needed to identify specific risks to each county within the state. Case studies for other coastal states can begin the process of identifying storm surge hazards affecting affordable housing of all types at local, state, and regional levels so that adaptive management can effectively respond in case of disaster. This study provides a foundation for policy makers, affordable housing advocates and producers to identify and support measures that will provide sufficient numbers of affordable housing in safer areas on the coast not only during disaster recovery, but in the general sphere of affordable housing and coastal development.

APPENDICES

Appendix A

Research Survey Instrument

1 Information about Being in a Research Study
Clemson University
LIHTC Development, Disaster Recovery, and Perceptions of Risk

Introduction
This study attempts to collect information about the perception of risk during disaster recovery for Low-Income Housing Tax Credit (LIHTC) developers.

Procedures
You will be asked a series of questions that will help determine how your company makes development decisions during disaster recovery. The questionnaire consists of approximately 18 questions and will take about 15 minutes or less. Questions are designed to determine how you would expect to respond to development opportunities that are typical for developers of LIHTC projects during disaster recovery. This questionnaire is conducted with an online Qualtrics-created survey.

Risks/Discomforts
Risks are minimal for involvement in this study. However, you may feel uneasy when asked to make judgments based on company experience.

Benefits
As a participant in this survey, you have the option to receive a summary of the aggregated results as long as you provide your contact data. Your contact information will be completely confidential and will only be available to the principal investigator. It is hoped that through your participation, researchers and policy makers will learn more about how low-income housing programs can better assist developers during disaster recovery.

Confidentiality
All data obtained from participants will be kept confidential and will only be reported in an aggregate format (by reporting only combined results and never reporting individual ones). All questionnaires will be concealed, and no one other than then principal investigator listed below will have access to them. The data collected will be stored in the HIPPA-compliant, Qualtrics-secure database until it has been deleted by the primary investigator.

Compensation
There is no direct compensation for participation in this research study.

Participation
Participation in this research study is completely voluntary. You have the right to withdraw at anytime or refuse to participate entirely without jeopardy. If you desire to withdraw, please close your internet browser and notify the principal investigator at this email: vhammet@clemson.edu. Or, if you prefer, inform the principal investigator by telephone at 864-247-0600.

Questions about the Research
If you have questions or concerns about this study or if any problems arise, please contact Dr Stephen Verderber at Clemson University at 864-656-3896, sverder@clemson.edu.

Questions about your Rights as Research Participants
If you have any questions or concerns about your rights in this research study, please contact the Clemson University Office of Research Compliance (ORC) at 864-656-6460 or irb@clemson.edu. If you are outside of the Upstate South Carolina area, please use the ORC's toll-free number, 866-297-3071.

Q2 I have read, understood, and printed a copy of, the above consent form. I agree to participate in this study.

- ❍ Yes (1)
- ❍ No (2)

If No Is Selected, Then Skip To End of Survey

Q3 When was the first time you worked on a project that utilized the LIHTC program? (Enter the approximate year as yyyy.)

Q4 Please provide details about the ownership structure of your company. (Select one)

- ❍ Private, for-profit (1)
- ❍ Non-Profit, 501(c)3 (2)
- ❍ Non-Profit, not tax exempt (3)
- ❍ I'm not sure. (4)

If Private, for-profit Is Selected, Then Skip To What is the geographic scope of the c...

Q5 Does your company operate as a Community Development Corporation (a not-for-profit organization that is specifically incorporated to offer services, provide programs, and engage in activities that promote and support community development)?

- ❍ Yes (1)
- ❍ No (2)
- ❍ I am not sure. (3)

Q6 What is the geographic scope of the company's LIHTC activities? (This question will help us understand the geographical reach of the company's LIHTC development activities. PLEASE SELECT ONE.)

- ❍ Within one county (parish or borough) (1)
- ❍ Multiple counties (parishes or boroughs) within one state (2)
- ❍ Multiple states (3)

Q7 Does your company engage in development projects that do not participate in the LIHTC program?

- ❍ Yes (1)
- ❍ No (2)

Q8 Does your company own LIHTC multi-family developments in a coastal county? (A county can also include a parish or borough)

- ❍ Yes (1)
- ❍ No (2)

Q9 Has your company sustained damages to a LIHTC unit as a result of hurricane damages? (A LIHTC unit is a single housing unit, such as a single apartment unit.)

- ❍ Yes (1)
- ❍ No (2)

Answer If Has your company sustained damages to a LIHTC unit as a r... Yes Is Selected

Q10 How many LIHTC units have been damaged as a result of a hurricane? A LIHTC unit is a single housing unit, such as a single apartment unit. (Select one)

- ❍ 1 (1)
- ❍ 2 - 5 (2)
- ❍ 6 - 10 (3)
- ❍ 11-20 (4)
- ❍ More than 20 (5)

Q11 Development in coastal counties involves additional risk because of the natural hazards from hurricanes. Hurricane Hugo caused extensive damage along the Atlantic coast in 1989. More than 18,000 multi-family housing units were damaged or destroyed. Hurricane Andrew struck the south and caused extensive housing damage in Florida and Louisiana. In 2005, Hurricane Katrina and Hurricane Rita caused damages on the Gulf Coast displacing many low-income households. Galveston, Texas lost nearly all multi-family housing units when Hurricane Ike hit the Gulf Coast in 2008. More recently, Hurricane Sandy hit the northeast damaging single-family and multi-family housing units in New Jersey and New York. Each of these hurricane events became presidentially declared disaster areas which opened access to disaster relief and funding for reconstruction and redevelopment. The following questions are intended to evaluate the influences your company considers when making development decisions during disaster recovery.

Q12 To what degree would the following general categories derail a LIHTC project during disaster recovery? Move the slider to rank the categories by level of importance from 0 (will definitely not derail) to 10 (would derail).

_____ SOCIAL: (i.e., public sentiment, advocacy group activities) (1)

_____ TECHNICAL: (i.e., Cap Rates, IRR, Income/Expenses) (2)

_____ ECONOMIC: (i.e., government funding, land acquisition) (3)

_____ ENVIRONMENTAL: (i.e., proximity to the coast, proximity impact areas) (4)

_____ GOVERNMENT: (i.e., government priorities, program changes) (5)

Q13 During disaster recovery, LIHTC is often combined with other programs to increase funding and encourage recovery participation. The following questions are intended to help us understand the programs that would influence your company participation in the recovery phase of disaster.

Q14 Given the following incentives, how likely would your company be willing to build a LIHTC multi-family development in an impact zone that has sustained severe damage from a hurricane disaster? An impact zone is often the area that was directly hit by the hurricane and sustains the most physical damage from the storm.

	Very Unlikely	Unlikely	Somewhat Unlikely	Undecided	Somewhat Likely	Likely	Very Likely
Community Development Block Grants (CDBG)	○	○	○	○	○	○	○
HOME funds	○	○	○	○	○	○	○
Supplemental LIHTC (LIHTC over and above normal state allocations)	○	○	○	○	○	○	○
Disaster Bonds	○	○	○	○	○	○	○
Mitigation Grants	○	○	○	○	○	○	○
Federal Disaster Loans	○	○	○	○	○	○	○
Small Business Administration Loans	○	○	○	○	○	○	○
Traditional Financing	○	○	○	○	○	○	○
Physical Disaster Business Loan	○	○	○	○	○	○	○
Federal Disaster Grants	○	○	○	○	○	○	○
Private Insurance	○	○	○	○	○	○	○
Road Home Small Rental Property Funding	○	○	○	○	○	○	○
New Market Tax Credits (NMTC)	○	○	○	○	○	○	○
Other	○	○	○	○	○	○	○

Q15 Please rank additional funding programs that may be combined with LIHTC that are critical to your company's participation in the development of LIHTC multi-family housing during disaster recovery. Move the slider to rank the program by level of importance from 0 (not critical) to 10 (extremely critical).

_____ Community Development Block Grants (CDBG) (1)

_____ Supplemental LIHTC (2)

_____ New Market Tax Credits (NMTC) (3)

_____ HOME FUNDS (4)

_____ Small Business Administration (SBA) Loans (5)

_____ Physical Disaster Business Loans (6)

_____ Disaster Bonds (7)

_____ Federal Disaster Loans (8)

_____ Federal Disaster Grants (9)

_____ Road Home Small Rental Property Funding (10)

_____ Mitigation Grants (11)

_____ Private Insurance (12)

_____ Traditional financing (13)

_____ Other (14)

Q16 When thinking about disasters, please rate the location preference for each of the following for a potential LIHTC development. Provide a rating using the following scale with 0 being Least Preferred to 10 being Most Preferred.

_____ The available site is NEXT to a parcel that flooded in a previous storm (1)

_____ An upcoming election may change disaster recovery priorities (2)

_____ Site location IS in a coastal county (3)

_____ Site location IS NOT in a coastal county (4)

_____ A development site is within 1 to 5 miles of the coast (5)

_____ A development site is between 5 and 10 miles from the coast (6)

_____ A development site is more than 10 miles from the coast (7)

_____ A development site is more than 25 miles from the coast (8)

_____ A site location is within a storm surge boundary (9)

_____ A site is not within a storm surge boundary (10)

_____ There could be some flooding during a hurricane. (11)

_____ There is some potential for storm surge damage during a hurricane (12)

_____ Other (13)

Q17 With all else being equal, to what degree would each of the following statements affect your willingness to participate in a LIHTC development project during disaster recovery? (Please rank each of the following statements along the scale of 0 to 10 using the sliders, with 0 indicating an unwillingness to participate and 10 indicating willingness to participate.)

_____ Public sentiment is against low-income housing (1)

_____ More regulations are imposed in coastal counties (2)

_____ Insurance costs are higher in a coastal area (3)

_____ Financing the project has unfavorable terms (4)

_____ More flexible regulations in a non-coastal county (5)

_____ Construction costs are rising in the recovery zones (6)

_____ Land costs are higher along the coast (7)

_____ Insurance costs are lower in counties that are not along the coast (8)

_____ Financing the project with favorable terms (9)

_____ Land costs are lower in areas away from the coast (10)

_____ Construction costs are stable in the recovery zones (11)

_____ Disaster relief programs are available for low-income multifamily housing (12)

_____ An advocacy group supports low-income housing in a specific community (13)

_____ Supplemental tax credits are available (14)

_____ A non-profit organization is willing to partner with us in developing the project (15)

_____ A for-profit organization is willing to partner with us in developing the project (16)

_____ A local neighborhood group is against low-income housing (17)

_____ Additional incentives are available to build in coastal counties (18)

_____ Other (19)

Q18 Thank you so much for your patience. There are only 3 questions left. These questions are asking for your expert opinion as a stakeholder in the field of low-income housing.

Q19 According to recent studies (Greene, 1992; Comerio et al., 1994; Finch et al., 2010) low-income households face dislocation because there are not enough low-income housing units constructed during disaster recovery. Why do you think this is a problem?

Q20 What suggestions would you offer to advocacy groups and community leaders to address low-income housing needs for low-income households?

Q21 How can housing and recovery programs be improved to encourage low-income housing development during disaster recovery?

Q22 The compiled data is strictly confidential and will be published in aggregated form. As a participant in the survey, your company has the option of receiving a summary of the results. Would you like to receive a summary of the results?

- ❍ Yes (1)
- ❍ No (2)

Answer If The compiled data is strictly confidential and will be pu... Yes Is Selected

Q23 You have indicated that your company would like to receive a summary of the survey results. In order to have results forwarded to you, please complete the form below. Your contact information is completely confidential and will only be used to deliver the summarized results. To maintain confidentiality, your contact information will not be matched with your survey answers.

Company Name (1)

Respondent's Name (2)

Email (3)

Date (4)

Q24 This is the end of the survey. We appreciate the information you have shared with us. Thank you for your time.

Appendix B

IRB Protocol # 2013-356 Exempt Category B-2

CLEMSON UNIVERSITY

Valerie Hammett <vhammet@g.clemson.edu>

Validation of IRB2013-356: LIHTC Development, Disaster Recovery, and Risk
1 message

Nalinee Patin <NPATIN@clemson.edu> Fri, Dec 13, 2013 at 8:39 AM
To: "sverder@clemson.edu" <sverder@clemson.edu>
Cc: "Valerie Hammett (vhammet@g.clemson.edu)" <vhammet@g.clemson.edu>

Dear Dr. Verderber,

The chair of the Clemson University Institutional Review Board (IRB) validated the protocol identified above using exempt review procedures and a determination was made on **December 12, 2013** that the proposed activities involving human participants qualify as **Exempt** under category **B2**, based on federal regulations 45 CFR 46. The approved consent document is attached for distribution. **Your protocol will expire on November 30, 2014.**

The expiration date indicated above was based on the completion date you entered on the IRB application. If an extension is necessary, the PI should submit an Exempt Protocol Extension Request form, http://www.clemson.edu/research/compliance/irb/forms.html, at least three weeks before the expiration date. Please refer to our website for more information on the extension procedures, http://www.clemson.edu/research/compliance/irb/guidance/reviewprocess.html.

No change in this approved research protocol can be initiated without the IRB's approval. This includes any proposed revisions or amendments to the protocol or consent form. Any unanticipated problems involving risk to subjects, any complications, and/or any adverse events must be reported to the Office of Research Compliance (ORC) immediately. All team members are required to review the "Responsibilities of Principal Investigators" and the "Responsibilities of Research Team Members" available at http://www.clemson.edu/research/compliance/irb/regulations.html.

The Clemson University IRB is committed to facilitating ethical research and protecting the rights of human subjects. Please contact us if you have any questions and use the IRB number and title in all communications regarding this study.

Good luck with your study.

All the best,

Nalinee

Nalinee D. Patin

REFERENCES

Adamowicz, W., Louviere, J., and Williams, M. 1994. Combining revealed and stated preference methods for valuing environmental amenities. *Journal of Environmental Economics and Management*, 26(3), 271-292.

Alsech, D. J. 2005. *Complex urban systems and extreme events: Toward a theory of disaster recovery.* Paper presented at the 1st International Conference of Urban Disaster Reduction, Kobe, Japan, January 8.

Anderson, Z. 2015. *Cost of flood insurance to go up 20 percent*. Herald-Tribune, March 31, 2015. Retrieved on March 30, 2015 from http://www.heraldtribune.com/article/20150331/ARTICLE/150339934

Annual Update of the HHS Poverty Guidelines, 78 Fed. Reg. 5182 (January 24, 2013) pp. 5181-5183

Archer, W.R., P.J. Elmer, D.M. Harrison, and D.C. Ling. 1998. Determinants of Multifamily Mortgage Default. *FDIC Working Paper No. 99-2*, Washington, DC.

Babbie, E. 2011. *The Basics of Social Research.* Belmont: Thomson Wadsworth.

Baum-Snow, N., Marion, J., 2009. The Effects of Low Income Housing Tex Credit Developments on Neighborhoods. *Journal of Public Economics*, 93(5-6), 654-666.

Bea, K. 2010. Federal Stafford Act Disaster Assistance: Presidential Declarations, Eligible Activities, and Funding. Library of Congress, Washington DC: Congressional Research Service.

Beatley, T. 2009. *Planning for coastal resilience: best practices for calamitous times*. Island Press.

Berke, P.R. and Beatley, T. 1997. *After the hurricane: Linking recovery to sustainable development in the Caribbean.* Baltimore, MD: Johns Hopkins University Press.

Berke, P.R., Kartez, J., and Wenger, D. 1993. Recovery after disaster: Achieving sustainable development, mitigation, and equity. *Disasters*, 17, 93-109.

Beven, J. L. 2014. Tropical Cycle Report: Hurricane Frances. National Hurricane Center, http://www.nhc.noaa.gov/data/tcr/AL062004_Frances.pdf retrieved on December 30, 2014.

Beven, J. L. II, Avila, L. A., Blake, E. S., Brown, D. P., Franklin, J. L., Knabb, R. D., Pasch, R. J., Rhome, J. R., and Stewart, S. R. 2008. Annual Summary: Atlantic Hurricane Season of 2005. *Monthly Weather Review,* Volume 136, pp. 1109-1173.

Bin, O., and Kruse, J. B. 2006. Real estate market response to coastal flood hazards. Natural Hazards Review.

Blake, E. S., Landsea, C. W. Landsea, and Gibney, E. J. Gibney. 2011. *The Deadliest, Costliest, and Most Intense United States Tropical Cyclones from 1851 to 2000.* National Oceanic and Atmospheric Administration, NOAA Technical Memorandum NWS NHC-6.

Bodie, Z, Kane, A., and Markus, A. 1993. *Investments.* Boston: Irwin.

Bockstael, N.E. and K.E. McConnell. 2007. Environmental Valuation with Revealed Preferences: A Theoretical Guide to Empirical Models. Kluwer Publishing.

Botts, H., Du, W., Jeffery, T., Suhr, L. 2014. *2014 CoreLogic Storm Surge Report*. July 2014.

Bradbury, J. A. 1989. The policy implications of differing concepts of risk. *Science, Technology and Human Values.* Volume 4, No. 4 (Autumn), pp. 380-399.

Buchanan, J. M., and Tullock, G. 1962. *The Calculus of Consent: Logical Foundations of Constitutional Democracy*. University of Michigan Press.

Buckle, P. 2005. "Disaster: mandated definitions, local knowledge and complexity", in Perry, R.W. and Quarantelli, E.L. (Eds), *What is a Disaster? New Answers to Old Questions*, Xlibris, Philadelphia, PA, pp. 173-200.

Byrne, P. 1996. *Risk, Uncertainty and Decision-making in Property Development*. E & F N Spon: London.

Cadman, D. and Topping, D. 1995. *Property Development*. E & F N Spon: London.

Cameron, S. 1990. Managing interest rate risk in real estate development. *Journal of Applied Corporate Finance,* 3 : 72-79.

Campanella, T. J. 2006. Urban resilience and the recovery of New Orleans.*Journal of the American Planning Association*, *72*(2), 141-146.

Car, L. J. 1932. Disaster and the Sequence Pattern of Social Change. *American Journal of Sociology,* 38: 207-218.

Carson, R. T., Mitchell, R. C., Hanemann, M., Kopp, R. J., Presser, S., & Ruud, P. A. 2003). Contingent valuation and lost passive use: damages from the Exxon Valdez oil spill. *Environmental and resource economics*, *25*(3), 257-286.

Chaplin, R., & Freeman, A. 1999. Towards an accurate description of affordability. *Urban Studies*, *36*(11), 1949-1957.

Cheng, P., Lin, Z. and Liu, Y. 2008. A Model of Time-on-Market and Real Estate Price Under Sequential Search with Recall. *Real Estate Economics*, 36: 813–843.

Clancy, P. E. 1990. Tax incentives and federal housing programs: Proposed principles for the 1990s. In D. DiPasquale & L. C. Keyes (Eds.), *Building foundations: Housing and federal policy* (Chapter 11). Philadelphia: University of Philadelphia Press.

Cohen, R. 2011. The Impacts of Affordable Housing on Health: A Research Summary. *Insights from Housing Policy Research.* Center for Housing Policy, retrieved from http://www.nhc.org/media/files/Insights_HousingAndHealthBrief.pdf on December 15, 2014.

Coles, E. and Buckle, P. 2004. Developing Community Resilience as a Foundation for Effective Disaster Recovery. *Australian Journal of Emergency Management*, Volume 19, Number 4, pp. 6–15.

Comerio, M. C. 1997. Housing issues after disasters. *Journal of Contingencies and Crisis Management*, *5*(3), 166-178.

Comerio, M. C. 1998. *Disaster Hits Home: New Policy for Urban Housing Recovery*. Berkeley: University of California Press.

Comerio, M. C., Landis, J. D., and Rofe, Y. 1994. Post-Disaster Residential Rebuilding, Working Paper 608, Institute of Urban and Regional Development, University of California, Berkeley, CA.

CoreLogic, 2011. *Annual Storm Surge Report, 2011: Residential Storm Surge Exposure Estimates for 10 U.S. Cities*, CoreLogic

Cresswell, J. 2007. *Research Design: Qualitative Inquiry and Research Design.* Thousand Oaks: Sage Publications.

Crossett K., Culliton T., Wiely P., and Goodspeed T. 2004. Population trends along the coastal United States: 1980–2008. Silver Spring, MD: National Oceanic and Atmospheric Administration. Coastal Trends Report Series.

Crowell, M., Coulton, K., Johnson, C., Westcott, J., Bellomo, D., Edelman, S., Hirsch, E. 2010. An Estimate of the U.S. Population Living in 100-Year Coastal Flood Hazard Areas. *Journal Coastal Research*. Vol. 26, (2) pp. 201-211.

Cutter, S., 1995. Forgotten Casualties: Women, Children and Environmental Change. *Global Environmental Change,* 5 (3), 181-194.

Cutter, S.L. 2005, "Are we asking the right questions?", in Perry, R.W. and Quarantelli, E.L. (Eds), *What is a Disaster? New Answers to Old Questions*, Xlibris, Philadelphia, PA, pp. 39-48.

Cutter, S. L. and C.T. Emrich. 2006. Moral Hazard, Social Catastrophe: The Changing Face of Vulnerability along the Hurricane Coasts. *Annals of the American Academy of Political and Social Science* 604 (1): 102-112.

Davidson, R. A. and Lambert, K. B. 2001. Comparing the Hurricane Disaster Risk of U.S. Coastal Counties. Natural Hazards Review, Vol. 2, No. 3, pp. 132-142.

DeNavas-Walt, C. and Proctor, B. E. 2014. Income and Poverty in the United States: 2013. Current Population Reports. Issued September 2014. U.S. Department of Commerce Economic and Statistics Administration, U.S. Census Bureau.

Dillman, D. A., Smyth, J. D. & Christian, L. M. 2011. *Internet, mail and Mixed-Mode Surveys: The Tailored Design Method*, 3rd edition. Hoboken, NJ: John Wiley & Sons, Inc.

Dombrowsky, W. 1981. Another Step Toward a Social Theory of Disaster. Preliminary Paper #70, Newark, DE: Disaster Research Center, University of Delaware.

Dullisear, R. 2001. Checklist helps tick off how to avoid pitfalls during development. *Australian Property Journal* 36: 509-514.

Dynes, R. 1998. Coming to Terms with Community Disaster. In E.L. Quarantelli (ed.) *What Is a Disaster: Perspectives on the Question.* Routledge, London.

Edson, C. L. 2011. Affordable Housing—An Intimate History. *Journal of Affordable Housing & Community Development Law*, 193-213.

Emanuel, K. 2005. Increasing Destructiveness of Tropical Cyclones Over the Past 30 Years. *Nature.* 436, pp. 686–688.

Enarson, E. 1998. Through Women's Eyes: A Gendered Research Agenda for Disaster Social Science. *Disasters.* 22(2): 157-173.

Enarson, E., Fothergill, A., and Peek, L. 2006. Gender and Disaster: Foundations and Directions, in H. Rodriguez, E. L. Quarantelli and R. R. Dynes (eds.) *Handbook of Disaster Research,* pp. 130-146, New York: Springer.

Eriksen, M. D. and Rosenthal, S. S. 2010. Crowd out effects of place-based subsidized rental housing: New evidence from the LIHTC program. *Journal of Public Economics* 94(1112):953 – 966.

ESRI 2013. ArcGIS Desktop: Release 10.1. Redlands, CA: Environmental Systems Research Institute.

Field, C. G. 1997. Building Consensus for Affordable Housing. *Housing Policy Debate, 8*(4), 801-832.

Finch, C., Emrich, C. T., and Cutter, S. L. 2010. Disaster disparities and differential recovery in New Orleans. *Population and Environment.* 31:179-202.

Fishcoff, B., Slovic, P., and Lichtenstein, S. 1983. The public vs. 'the experts' in *The analysis of actual vs. perceived risks,* V.T. Covello, W. G. Flamm, J. V. Rodricks, and R. G. Tardiff, 235-249, New York: Plenum.

Fischer, H. W. 1998. *Response to disaster: Fact versus fiction & its perpetuation: The sociology of disaster*. University Press of America.

Fischer, H.W. 2003. The Sociology of Disaster: Definitions, Research Questions, & Measurements. Continuation of the Discussion in a Post-September 11. *Environment. International Journal of Mass Emergency and Disasters*, 1:91–107

Fischer H.W. III. 2008. *Response to Disaster: Fact versus Fiction and its Perpetuation*, 3rd ed. Lanham, MD: University Press of America.

Fischer, W. and Sard, B. 2006. Housing Needs of Many Low-Income Hurricane Evacuees are Not Being Addressed. Center on Budget and Policy Priorities. Washington, D.C.

Florida Department of Health. 2012. Florida Population Atlas. Retrieved on 2/5/2015 at http://www.floridacharts.com/Charts/atlas/population/PopAtlas2012/narrative.pdf

Fothergill, A. and Peek, L. A. 2004. Poverty and Disasters in the United States: A Review of Sociological Findings. *Natural Hazards* 32:89-110.

Freeman, A., Chaplin, R., and Whitehead, C. M. E. 1997. Rental Affordability: A Review of International Literature. Discussion Paper No. 88. Cambridge, England: Cambridge University, Department of Land Economy.

Fritz, C.E. 1961. "Disaster." Pp. 651-94 in Contemporary Social Problems, in R. K. Merton and R.A. Nisbet (eds). New York: Harcourt, Brace & World, Inc.

Fritz HM, Blount C, Sokoloski R, Singleton J, Fuggle A, McAdoo BG, Moore A, Grass C, Tate B (2008) Hurricane Katrina storm surge reconnaissance. J Geotech Geoenviron Eng, ASCE 134(5):644–656. doi:10.1061/(ASCE)1090-0241(2008)134:5(644)

Furman Center. 2013. Sandy's Effects on Housing in New York City. March 2013. Furman Center for Real Estate and Urban Policy and Moelis Institute for Affordable Housing, New York City University.

Galster G, Walker C, Hayes C, Boxall P, Johnson J. 2004. Measuring the impact of Community Development Block Grant spending on urban neighborhoods. *Housing Policy Debate*. 15(4): 903-34.

GAO – See U.S. Governmental Accounting Office [GAO]

Glaeser, E. L. and Gyourko, J. 2008. *Rethinking Federal Housing Policy*, Washington: American Enterprise Institute.

Glahn, B., Taylor, A., Kurkowski, N., & Shaffer, W. A. 2009. The role of the SLOSH model in National Weather Service storm surge forecasting. National Weather Digest, 33(1), 3-14.

Godschalk, D. R., Brower, D. J., and Beatley, T. 1989. *Catastrophic Coastal Storms: Hazard Mitigation and Development Management*. Duke University Press.

Goetz, E. G. 2004. The Reality of Deconcentration. *Shelterforce Online,* Issue #138, November/December 2004. Retrieved on March 12, 2015 at http://www.nhi.org/online/issues/138/deconcentration.html

Goetz, E. G. 2013. *New Deal Ruins: Race, Economic Justice, & Public Housing Policy.* Cornell University Press.

Gotham K. F. and Greenberg, M. 2008. From 9/11 to 8/29: Post-Disaster Recovery and Rebuilding in New York and New Orleans. *Social Forces* , Vol. 87, No. 2, pp. 1039-1062, Oxford University Press, Article Stable URL: http://www.jstor.org/stable/20430902

Graham, L. 2012. Advancing the human right to housing in post-Katrina New Orleans: discursive opportunity structures in housing and community development. *Housing Policy Debate,* 22:1, 5-27.

Green, T. F., & Olshansky, R. B. (2012). Rebuilding housing in New Orleans: the Road Home Program after the Hurricane Katrina disaster. *Housing Policy Debate*, *22*(1), 75-99.

Gustafson, J. and Walker, J. C. 2002. *Analysis of State Qualified Action Plans for the Low Income Housing Tax Credit Program.* Submitted to the U.S. Department of Housing and Urban Development. The Urban Institute, Metropolitan Housing and Communities Policy Institute, Washington, D.C.

Haas, J. E., Kates, R., and Bowden, M. 1977. *Reconstruction following disaster.* Cambridge, MA: MIT Press.

Hamin, E. M., & Gurran, N. (2009). Urban form and climate change: Balancing adaptation and mitigation in the US and Australia. *Habitat international*, *33*(3), 238-245.

Hargitay, S.E. and Yu, S. 1993. Property Investment Decisions: A Quantitative Approach, E.&F.N. Spon, London.

Harrington, S. E.. 2006. Has Rethinking Disaster Policy After Hurricane Katrina. In R. J. Daniels, D. F. Kettl, and H. Kunreuther (Eds.) *On Risk and Disaster: Lessons from Hurricane Katrina,* Philadephia, PA: University of Pennsylvania Press.

Heinz Center. 2000. *The Hidden Costs of Coastal Hazards: Implications for Risk Assessment and Mitigation.* Island Press: Washington, D.C.

Henry, M., Cortes, A., & Morris, S. 2013. *The 2013 Annual Homeless Assessment Report to Congress: Part 1, Point-In-Time Estimates of Homelessness*, The U.S. Department of Housing and Urban Development, Office of Community Planning and Development.

[HHS] U.S. Department of Health and Human Services, 2013. *2013 Annual Poverty Guidelines* retrieved from http://aspe.hhs.gov/poverty/13poverty.cfm on December 15, 2014.

Hickey, R., Lubell, J., Haas, P., & Morse, S. 2012. *Losing Ground: The Struggle of Moderate-Income Households to Afford the Rising Costs of Housing and Transportation*. Retrieved on December 30, 2014 from http://www.nhc.org/media/files/LosingGround_10_2012.pdf

Hollar, M. K. 2014. *Understanding Whom the LIHTC Program Serves: Tenants in LIHTC Units as of December 31, 2012,* U.S. Department of Housing and Urban Development, Office of Policy and Research.

Hooks, J. P., and Miller, T. B. 2006. Continuing Storm: How Disaster Recovery Excludes Those Most in Need, The. *Cal. WL Rev.*, *43*, 21.

Hoover, Herbert: "Statement Announcing the White House Conference on Home Building and Home Ownership," September 15, 1931.Online by Gerhard Peters and John T. Woolley, *The American Presidency Project*. http://www.presidency.ucsb.edu/ws/?pid=22804

Hurricane Housing Working Group [HWG], 2005. Recommendations to Assist in Florida's Long Term Housing Recovery Efforts. Report and Recommendations of the Hurricane Housing Working Group created by Executive Order 04-240, February 2015.

Igan, D., & Pinheiro, M. 2010. Exposure to real estate in bank portfolios. *Journal of Real Estate Research*, *32*(1), 47-74.

IPCC, 2012. Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of the Intergovernmental Panel on Climate Change, Cambridge University Press.

IPCC, 2014: Summary for policymakers. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L.White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1-32.

Joint Center for Housing Studies of Harvard University. 2013. *State of the Nation's Housing 2013.* Cambridge, MA: Author. Retrieved on December 12, 2014 at www.jchs.harvard.edu/publications/markets/son2012/son2012.pdf.

Joint Center for Housing Studies of Harvard University. 2012. *State of the Nation's Housing 2012.* Cambridge, MA: Author. Retrieved on September 9, 2013 at http://www.jchs.harvard.edu/sites/jchs.harvard.edu/files/son2013.pdf

Kates, R. W., Colten, C. E., Laska, S., & Leatherman, S. P. 2006. Reconstruction of New Orleans after Hurricane Katrina: a research perspective. *Proceedings of the National Academy of Sciences*, *103*(40), 14653-14660.

Katz, B. J., Turner, M. A., Brown, K. D., Cunningham, M., and Sawyer, N. 2003. *Rethinking Local Affordable Housing Strategies: Lessons from 70 years of policy*

and practice. Washington, DC: Brookings Institution Program on Metropolitan Policy and the Urban Institute.

Keim, M. E. 2011. Preventing Disasters: Public Health Vulnerability Reduction as a Sustainable Adaptation to Climate Change. *Disaster Medicine and Public Health Preparedness*, *5*(02), 140-148.

Khadduri, J. 2013. Creating balance in the locations of LIHTC developments: The role of qualified allocation plans. *Washington, DC: Poverty and Race Research Action Council*.

Khadduri, J., Climaco, C., Burnett, K., Gould, L., & Elving, L. 2012. What Happens to Low-Income Housing Tax Credit Properties at Year 15 and Beyond? *US Department of Housing and Urban Development, Office of Policy and Development Research*.

Klein, R.J.T., Nicholls, R.J., and Mimura, N., 1999. Coastal adaptation to climate change: can the IPCC technical guidelines by applied? Mitigation and Adaptation Strategies for Global Change, 4, 51–64.

Klein, R.J.T., Nicholls, R.J.; Ragoonaden, S., Capobianco, M.; Aston, J., and Buckley, E.N., 2001. Technological options for adaptation to climate change in coastal zones. *Journal of Coastal Research*, 17(3), 531–543.

Knight, F. H., 1921. *Risk, Uncertainty, and Profit.* New York: Hart, Schaffner, and Marx.

Khumpaisal, S., & Ross, A. 2009. Analytic Approach to Risk Assessment in Real Estate Development. In *4th Annual Conference Liverpool BEAN*, p. 60.

Knutson, T. R., and R. E. Tuleya, 2004: Impact of CO2-induced warming on simulated hurricane 498 intensity and precipitation: Sensitivity to the choice of climate model and convective 499 parameterization. J. *Climate*, 17, 3477–3495.

Knutson TR, McBride JL, Chan J, Emanuel K, Holland GJ, Landsea CW, Held CI, Kossin JP, Srivastava AK, Sugi M (2010) Tropical cyclones and climate change. *Nature Geoscience*, 3:157–163

Kunreuther, H. 2006. Has the Time Come for Comprehensive Natural Disaster Insurance? In R. J. Daniels, D. F. Kettl, and H. Kunreuther (Eds.) *On Risk and Disaster: Lessons from Hurricane Katrina,* Philadephia, PA: University of Pennsylvania Press.

Landsea, C. W., Pielke Jr, R. A., Mestas-Nunez, A. M., & Knaff, J. A. 1999. Atlantic basin hurricanes: Indices of climatic changes. Climatic change, 42(1), 89-129.

Langis, J. 2013. Adaptation measures for floods, storm surges, and sea level rise. Groupe Littoral et vie Université de Moncton, February 2013.

Lawrence, M. B. and Cobb, H. D. 2014. Tropical Cycle Report: Hurricane Frances. National Hurricane Center, http://www.nhc.noaa.gov/data/tcr/AL112004_Jeanne.pdf retrieved on December 30, 2014.

Levine, J. N., Esnard, A. M., & Sapat, A. 2007. Population Displacement and Housing Dilemmas Due to Catastrophic Disasters. *Journal of Planning Literature*, *22*(1), 3-15.

Liu, Y. C., Liu, W. B., Sun, M. X. 2011. Analysis of Risk of Commercial Real Estate Based on Multiple Attribute Group Decision-Making. *Advanced Materials Research,* Vol. 368-373, 1920.

Lofstedt, R.E. and Frewer, L. (eds). 1998. *The Earthscan Reader in Risk and Modern Society.* London: Earthscan.

Maclennan, D., & Williams, R. 1990. Affordable housing in Britain and the United States. *York: Joseph Rowntree Foundation*.

Malpezzi, S., Vandell, K., 2002. Does the low-income housing tax credit increase the supply of housing? *Journal of Housing Economics,* 11 (4), 360-380.

Markham, J. 2001. Development finance: Analysing structures here and internationally. *Australian Property Journal*, 36 : 695-703.

Marlowe, H. 1999. Assessing the economic benefits of America's coastal regions. *Trends and future challenges for US National Ocean and Coastal Policy*, 77.

Maxwell, J. 2005. *Qualitative Research Design: An Interactive Approach (2nd ed).* Thousand Oaks, CA: Sage Publications.

McCarthy, K. F. and Hanson, M. 2008. Post-Katrina Recovery of the Housing Market along the Mississippi Gulf Coast. A Technical Report, Rand Gulf States Policy Institute.

Meléndez, E., Schwartz, A., and de Montrichard, A. 2008. Year 15 and preservation of tax-credit housing for low-income households: An assessment of risk. *Housing Studies* 23(1):67–87.

Miles, M.E., Berens, G. and Weiss, M.A. 2000. Real Estate Development: Principles and Process. Washington, DC: Urban Land Institute.

Mileti, D. 1999. Disasters by Design: A Reassessment of Natural Hazards in the United States. Washington, D.C.: Joseph Henry Press.

Morrison, L., J. 2007 "The STEEP Sectors", University of North Carolina at Chapel Hill, Learning Resources Website, USA (30 Jan. 08)

Mueller, E. J., Bell, H., Chang, B. B., and Henneberger, J. 2011. Looking for Home after Katrina: Postdisaster Housing Policy and Low-Income Survivors. *Journal of Planning Education and Research,* 31(3): 291-307

Nakagawa, Y. and Shaw, R. 2004. Social capital: A missing link to disaster recovery. *International Journal of Mass Emergencies and Disasters,* 22(1), 5-34.

National Marine Fisheries Service. 2014. Fisheries Economics of the United States, 2012. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-F/SPO-137, 175 p.

Nelson, A. C. 2014. Survey of Public-Private Partnership Tools and the Role of Public Patient Equity to Leverage Private Real Estate Development. In Foundations of Real Estate Development Financing (pp. 99-135). Island Press/Center for Resource Economics.

Newell, G. and Steglick, M. 2006. Assessing the Importance of Property Development Risk Factors. *Pacific Rim Property Research Journal,* Vol. 12, No. 1, pp. 22-37.

Nguyen, M. T. 2005. Does affordable housing detrimentally affect property values? A review of the literature. *Journal of Planning Literature*, *20*(1), 15-26.

Nigg, J. M. 1995. Disaster recovery as a social process. *Wellington after the quake: The challenge of rebuilding* (pp. 81-92). Wellington, New Zealand: The Earthquake Commission.

NOAA [National Oceanic and Atmospheric Administration]. 2013a. National coastal population report: population trends from 1970–2020 [Internet]. Washington, DC: National Oceanic and Atmospheric Administration [accessed April 3, 2015]. Available from: http://stateofthecoast.noaa.gov/features/coastal-population-report.pdf

NOAA [National Oceanic and Atmospheric Administration]. 2013b. National coastal population report: population trends from 1970–2020 [Internet]. Washington, DC: National Oceanic and Atmospheric Administration [accessed April 3, 2015]. http://stateofthecoast.noaa.gov/coastal_economy/welcome.html

Oliver-Smith, A. 1996. Anthropological research on hazards and disasters. *Annual review of anthropology*, 303-328.

O'Looney, J. 2000. *Beyond Maps: GIS and Decision Making in Local Government.* ESRI Press: Redlands, CA.

O'Regan, K. M., and Ouigley, J. M. 2013. Federal Policy and the Rise of Nonprofit Housing Providers (Tighe, J. R. and Mueller, E. J., editors), *Affordable Housing Reader*, p. 257.

Pasch, R. J., Brown, D. P. and Blake, E. S. 2011. Tropical Cycle Report: Hurricane Charley. National Hurricane Center, http://www.nhc.noaa.gov/data/tcr/AL032004_Charley.pdf retrieved on December 30, 2014.

Peacock, W. G., Dash, N., & Zhang, Y. 2007. Sheltering and Housing Recovery Following Disaster*. In Handbook of disaster research (pp. 258-274). Springer New York.

Perry, R. W. 2007. What is a Disaster?. (H. Rodriquez, E. L. Quarantelli, and R. Dynes, eds.), *Handbook of Disaster Research,* (pp. 1-15). Springer New York.

Pidgeon, N.F., Hood, C., Jones, D., Turner, B.A. and Gibson, R. 1992. Risk perception, in: Risk - Analysis, Perception and Management pp. 89-134, London: Royal Society.

Pielke Jr, R. A., Gratz, J., Landsea, C. W., Collins, D., Saunders, M. A., & Musulin, R. 2008. Normalized hurricane damage in the United States: 1900–2005. *Natural Hazards Review*, *9*(1), 29-42.

Plough, A., and Krimsky, S. 1987. The emergence of risk communication studies: social and political context. *Science, Technology, & Human Values*, 12(3/4), 4-10.

Plyler, A. 2013. Facts for Features: Hurricane Katrina Recovery. Greater New Orleans Community Data Center, Press Release dated February 2, 2013.

Popkin, S. J., Turner, M., and Burt, M. 2006. Rebuilding Affordable Housing in New Orleans: The Challenge of Creating Inclusive Communities. Rebuilding Opportunity and Equity into the *New* New Orleans. The Urban Institute. Washington, D.C.

Postyn, S. H. 1994. *The low income housing tax credit: A study of its impact at the project level.* Master's thesis, Massachusetts Institute of Technology, Cambridge, MA.

Quigley, J. M. 2000. A decent home: Housing policy in perspective. Brookings-Wharton Papers on Urban Affairs, 53-99.

Reece, J., Rogers, C., Martin, M., Lawson, S., Lee, J., and Singh, A. 2011. Galveston after Ike: Moving Together Towards a Full Recovery. Kirwin Institute for the Study of Race and Ethnicity: Ohio State University.

Rehfeld, A. 2005. *The Concept of Constituency*. New York: Cambridge

Revi, A., D.E. Satterthwaite, F. Aragón-Durand, J. Corfee-Morlot, R.B.R. Kiunsi, M. Pelling, D.C. Roberts, and W. Solecki, 2014: Urban areas. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L.White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 535-612.

Reznick Group. 2011. The Low-Income Housing Tax Credit Program at Year 25: A Current Look at Its Performance. Retrieved on December 15, 2014 from http://www. reznickgroup.com/sites/reznickgroup.com/files/papers/reznickgroup_lihtc_ survey_2011.pdf

Richardson, T. M. and Renner, R. N., Geographic Information Systems Supporting Disaster Response and Recovery. *Cityscape*, Vol. 9, No. 1, 2007. Available at SSRN: http://ssrn.com/abstract=1089502

Roberts, B. 2009. Strengthening the Low Income Housing Tax Credit Investment Market. *Community Investments,* Volume 21, Issue 3. Winter 2009/2010.

Rubin, C. B. 1985. The community recovery process in the United States after a major natural disaster. *International Journal of Mass Emergencies and Disasters.* 3(2), 9-28.

Rubin, C. B. and Barbee, D. 1985. Disaster recovery and hazard mitigation: Bridging the intergovernmental gap. In Emergency Management: A challenge for public administration, pp. 57-63. *Public Administration Review.* January, 45.

Rubin, C. B., & Popkin, R. 1990. *Disaster recovery after hurricane Hugo in South Carolina*. Natural Hazards Working Paper Series, Working Paper #69, Center for International Science, Technology and Public Policy, The George Washington University.

Rusk, David. 2001. *Inside Game Outside Game*. Brookings Institution Press.

Salama, A. M., & Alshuwaikhat, H. M. (2006). A trans-disciplinary approach for a comprehensive understanding of sustainable affordable housing. *Global Built Environment Review*, *5*(3), 35-50.

Samuelson, P. A. 1948. Consumption theory in terms of revealed preference. *Economica,* 243-253.

Samuelson, P. A. 1950. The problem of integrability in utility theory. *Economica,* 355-385.

Savas, E. S. 1987. *Privatization: The Key to Better Government.* Chatham, NJ: Chatham House Publishers.

Savas, E. S. 2000. Privatization and the New Public Management. 28 Fordham Urb. L.J. 1731 (2000-2001).

Schensul, S. L., Schensul, J. J., & LeCompte, M. D. 1999. *Essential ethnographic methods: Observations, interviews, and questionnaires* (Vol. 2). Altamira Press.

Schwab, J., Topping, K.C., Eadie, C., Deyle, R., and Smith, R. 1998. Planning for Postdisaster Recovery and Reconstruction. *PAS Report 483/484.* Chicago, IL: American Planning Association.

Schwartz, A. F. 2010. *Housing Policy in the United States*, 2nd Edition. Routledge. New York.

Schwartz, A. F. 2014. *Housing policy in the United States,* 3rd Edition. Routledge, New York.

Simunovich, David V. 2008. *The Quiet of Dissolution: Post-Disaster Redevelopment and Status-Preserving Compensation,* Seton Hall Law Review: Vol. 38: Iss. 1, Article 7. Available at: http://scholarship.shu.edu/shlr/vol38/iss1/7

Singleton, R.A. and Straits, B.C. 2005. *Approaches to Social Research*. New York: Oxford University Press.

Slovic, P. E. 2000. *The Perception of Risk*. Earthscan Publications, London: UK.

Slovic, P., Fischhoff, B., & Lichtenstein, S. 1979. Rating the risks. *Environment: Science and Policy for Sustainable Development*, *21*(3), 14-39.

Smith, D. 2005. Through the glass darkly. In Perry, R.W. and Quarantelli, E.L. (Eds), *What is a Disaster? New Answers to Old Questions*, Xlibris, Philadelphia, PA, pp. 292-307.

Smith, K. 2013. *Environmental hazards: assessing risk and reducing disaster*. Routledge.

Smith, G., & Wenger, D. 2007. Sustainable disaster recovery: Operationalizing an existing agenda. In H. Rodriguez, E. Quarantelli, & R. Dynes (Eds.), Handbook of disaster research (pp. 234–257). New York: Springer.

Somerville, C. T., & Mayer, C. J. 2003. Government regulation and changes in the affordable housing stock. *Economic Policy Review, 9*(2).

Spangle, William & Associates, Inc. 1991. *Rebuilding After Earthquakes: Lessons from Planners*. Portola Valley, California: William Spangle & Associates, Inc.

Stallings, R. A. 1998. Disaster and the theory of social order. In E. L. Quarantelli, (Ed.), *What is a Disaster? Perspectives on the Question*, pp. 127-145, New York: Routledge.

Stallings, R.A. 2005. Disaster, crisis, collective stress and mass deprivation. In Perry, R.W. and Quarantelli, E.L. (Eds), *What is a Disaster? New Answers to Old Questions*, Xlibris, Philadelphia, PA, pp. 237-274.

Stake, R. E. 2000. Case studies. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research*, pp.435-453, Thousand Oaks: Sage.

Stegman, Michael A. 1991. The Excessive Costs of Creative Finance: Growing Inefficiencies in the Production of Low-Income Housing. *Housing Policy Debate,* 2(2):357–73.

Stegman, Michael A. 1992. Comment on Kathryn P. Nelson and Jill Khadduri's "To Whom Should Limited Housing Resources Be Directed?" *Housing Policy Debate*, 3(1):57–66.

Stewart, S. R. 2011. Tropical Cycle Report: Hurricane Charley. National Hurricane Center, http://www.nhc.noaa.gov/data/tcr/AL092004_Ivan.pdf retrieved on December 30, 2014.

Stone, M. E. 1993. *Shelter Poverty: New Ideas on Housing Affordability*. Philadelphia: Temple University Press.

Stone, M. E. 2006. What Is Housing Affordability? The Case for The Residual Income Approach. *Housing Policy Debate, 17*(1), 151-184.

Tabachnick, B. G., & Fidell, L. S. 2007. Profile analysis: the multivariate approach to repeated measures. Using multivariate statistics. Boston (MA): Pearson Education, Inc, 311-74.

Teaford, J. C. 2000. Urban renewal and its aftermath. *Housing Policy Debate,11*(2), 443-465.

Teddlie, C., & Yu, F. 2007. Mixed methods sampling: A typology with examples. Journal of Mixed Methods Research, 1, 77-100

Thomas, J. M. 1997. Redevelopment and Race. Baltimore: Johns Hopkins University Press.

Tierney, K. 2006. Social Inequality, Hazards, and Disasters. In R. Daniels, D. Kettl, and H. Kunreuther (Eds.), *On Risk and Disasters: Lessons from Hurricane Katrina,* pp. 109-128, Philadelphia: University of Philadelphia Press.

Tol, R. S., Klein, R. J., & Nicholls, R. J. 2008. Towards Successful Adaptation to Sea-Level Rise Along Europe's Coasts. *Journal of Coastal Research*, 432-442

United Nations International Strategy for Disaster Risk [UNISDR], 2005. Note on Terminology from the WCDR Conference Secretariat to the Drafting Committee (18/11/2004) retrieved http://www.unisdr.org/2005/wcdr/intergover/drafting-committe/terminology.pdf on March 23, 2015

Unity of Greater New Orleans. 2010. Search and Rescue Five Years Later: Saving People Still Trapped in Katrina's Ruin. A report of the Abandoned Buildings Outreach Team, August 2010.

US Commission on Ocean Policy. 2004. An Ocean Blueprint for the 21st Century: Final Report of the US Commission on Ocean Policy. Washington (DC), US Commission on Ocean Policy.

U.S. Government Accountability Office [GAO]. 2010. *Disaster Assistance: Federal Assistance for Permanent Housing Primarily Benefited Homeowners; Opportunities Exist to Better Target Rental Housing Needs.* (Publication Number GAO-10-17)

Virmani, J. I., & Weisberg, R. H. 2006. The 2005 hurricane season: An echo of the past or a harbinger of the future?. Geophysical research letters, 33(5).

Viveiros, J. and Sturtevant, L. 2014. *Housing Landscape 2014.* Center for Housing Policy Report.

Vuk, V. 2008. Taking advantage of disaster: misrepresentation of housing shortage for political gain. *International Journal of Social Economics*, Vol. 35 Iss: 8, pp.603 – 614

Webster P.J., Holland G.J., Curry J.A., Chang H-R. 2005. Changes in tropical cyclone number, duration and intensity in a warming environment. *Science*, 309:1844–1846.

White, G. F. 1945. Human Adjustment to Floods. Chicago: The University of Chicago.

Williamson, A. R. 2011. Can they afford the rent? Resident cost burden in low income housing tax credit developments. *Urban Affairs Review*, *47*(6), 775-799.

Wu, J. and Lindell, M. K. 2003. *Housing Reconstruction after Two Major Earthquakes: The 1994 Northridge Earthquake in the United States and the 1999 Chi-Chi Earthquake in Taiwan.* Hazard Reduction & Recovery Center, Texas A&M University.

Yin, R. K. 2009. *Case Study Research: Design and Methods (4th ed).* Thousand Oaks, CA: Sage Publications.